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THE PRACTICAL TEACHER'S ART MONTHLY

Vol. XXIX. No. 12. JUNE, 1909. Price 6d.

Notices to Correspondents and Subscribers.

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All literary communications should be addressed to the Editor, Office of "The Practical Teacher," 35 and 36 Paternoster Row, London, E.C.

Remittances, Cheques, Post-Office Orders, etc., should be made payable to Thomas Nelson and Sons. Advertisement rates on application.

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Educational Opinion.

LORD MORLEY, who is Chancellor of the Victoria University (of Manchester), opened the new Union buildings of the University recently, and gave one of those inspiriting addresses of which he appears to own the secret. Naturally enough, he spoke of the charms of the pursuit of knowledge for its own sake. And also (for who better qualified to do it than he?) he spoke of the value of literature, "which has shaken the world, and which I, for one, will never stand to hear put into the second place." The stimulation of the social life which comes from an institution like a Union—the pleasure and value of college friendships, formed when the character is malleable and interests are glowing and ardent, and sympathy abounds—found a place in the Chancellor's speech, which contained one note of a different tenor. He quoted from Lord Curzon's memorandum on Oxford, which had just been published, to the effect that if Oxford were not careful, the provincial universities, of which Victoria is the most prominent, would drain from it the suffrages of a large class of the community which it was greatly to the interest of Oxford to retain. Seeing that Lord Morley speaks as one who knows both, the warning seems fully justified.

Lord Morley on University Life.

THE question of the retention or dismissal of married women teachers is much discussed in journals, daily and otherwise, of every brand and colour. It is complicated by the other question of finding posts for young trained teachers, and the writers who rush into print generally confuse the two issues. Some of the provincial authorities have treated the matter briefly and rigorously by fixing a date on which to determine the engagements of married women. On this opinions are strongly divided, and there are not wanting those who go to the other extreme of saying that they would only employ women teachers who are married and have children of their own. Without going so far as these Quixotes, we can safely urge that in numberless cases married teachers have been a real boon to a school, and that the short shrift dealt out to them by some authorities is more than a little severe. But the other question—the finding of employment for the young teachers—is quite of a different order. It is to be solved at once, and for very many years to come, by the reduction of classes to a reasonable size, and by the extinction of the unqualified supernumerary, who, whatever her *personal* claims, is a blot on any educational system worthy of the name.

The Burning Question.

ONCE again the American history book for schools has come in for denunciation, this time by an American writer and lecturer, Mr. Edwin Mead. He says, what has been said before, that the school histories are responsible for the anti-British feeling which exists among some classes in America. The books are written in a spirit hostile to Great Britain, and are at no pains to be exact if exactitude involves showing the British in a good light. The strangest commentary on this is that, as Mr. Mead truly says, English class-books are generally favourable to America, and that the great men of American history are invariably admired by the British. We thought that since the last exposure a few years ago an improvement had taken place in American text-books. Apparently we were wrong; but there are signs that steps will be taken to remove such a blot on American school literature. It is a curious comment on the whole affair that the best book on American government was written by an Englishman, Mr. Bryce, and one of the best books on English government by an American, Mr. Lawrence Lowell. What a whirligig of revenges!

Tainted Text-Books.

ANOTHER Giant Blunderbore is overthrown, or rather another deity is dethroned—Euclid. Following hard on the heels of the Circular relating to the teaching of history in secondary schools, comes another on the teaching of geometry, and the net result of the suggestions and injunctions it contains is that, officially speaking, the Euclid of the past disappears in the lumber-room where worn-out methods and the useless odds and ends of education are kept.

One had come to look on Euclid as an immovable thing, lasting as the Pyramids themselves, and the woeful thing called Euclidian geometry, with its definitions, axioms, postulates, and formal proofs, as something which every schoolboy must perforce endure and battle through, just as he did with measles and whooping-cough. But for some time past there has been a fluttering in the dovecots of the geometers, and modern practical and comprehensible methods have found their way into the geometry class, with the best of results. This Circular will go far to provide a handsome funeral for the bugbear of our youth.

Exit Euclid.

IN these circulars we find a new flavour. The writer of the present one has a caustic humour of his own. He even dares to make fun of the sacred processes of Euclidian geometry. It is refreshing to be asked, "Why spend precious time in futile efforts to demonstrate the obvious?" How many generations of youngsters, groaning over "maths," have memorised that famous definition of a straight line, and felt themselves no further on in knowledge for the effort. "Straight needs no explanation," says the Circular writer, "and all attempts at definition are waste of time." Short shrift for the definitions; equally speedy execution for the axioms—"the best course is probably never to mention them." "When I consider how my time was spent" (to adapt a famous line) in the "maths" class, I gasp at the daring of the Circular. It is almost too good to be true. But its wise suggestions of modern experimental methods, the proper treatment of algebra, the use of graphic work, even to the plotting out of statistics, open up a vista of rational mathematics for which the present schoolboy should express his gratitude on bended knees. All the same—poor Euclid!

An Official Humourist.

SOME interesting statistics are given in the report of the American Commissioner of Education, Dr.

Elmer Ellsworth Brown. The total school population of all grades—that is, up to the high school grade—is close upon nineteen millions. The percentage of the population which attended the public schools for a longer or a shorter period has remained stationary, he says, for some thirty years. This seems surprising, considering how the population grows. But there has been a vast improvement during that time on other lines. The average school year of the primary school has advanced from 130 days to a little more than 150. Even then it seems short enough, in all truth; but the heat of the American summer, which makes school-keeping almost impossible during July, August, and September, must be taken into account. And the average attendance during that length of year has improved from 62 per cent. to 70 per cent. The figures strike one as unpleasantly surprising; but the conditions of school life in many of the newer states differ vastly from those in an old country like England. And school attendance is the very first thing to feel the difficulty of social surroundings.

Statistics from the States.

* * *

ONCE before, in these columns, we noted an experiment made by a French officer upon the recruits who came yearly into his company *faire leur service*—to serve their time. He was in the habit of taking at random groups of twenty men and examining them in the rudiments of French history. As the men had passed at least through the primary schools, he had in these examinations a rough test of the durability of knowledge gained in school, in a subject which is compulsory. The results were, as a rule, surprising, and the most recent are equally so. Imagine 25 per cent. ignorant of Joan of Arc, 55 per cent. knowing nothing of Napoleon, 56 per cent. of Bayard, and 65 per cent. of Louis XIV.! It is almost incredible. Even where the recruit fancied he knew something and ventured a "shot," the arrow flew very wide of the mark. Gambetta was described as a "scientific discoverer" and a "President of the Republic;" Victor Hugo was variously described as "a musical composer," "a lawyer of ancient times," and even as "the inventor of vaccination;" while Napoleon was equally badly maltreated.*

Vanished Knowledge.

It is ill work throwing stones; we live in a house that contains too much glass ourselves. But it "gives furiously to think" of the ultimate value of much teaching on which pains, time, and thought are lavished.

* * *

ARE we going to have a campaign on behalf of memorising once more? It would be a natural thing, a swinging back of the pendulum. An American journal takes up the cudgels in favour of memory work, and quotes the practice of the late Professor Child of Harvard, a most successful teacher of literature. He required his students to commit to memory at least five or six pages of any play they took up for study. And the New York journal quotes this with approval, averring that we seem to be afraid of asking boys and girls to memorise long passages from literature.

In Praise of Memory.

We doubt whether the professor's practice is likely to be much followed. He seems to have fallen into the error of most enthusiasts, and to have gone to extremes. But there is this basis of truth in it, that in our revulsion from the old practice of pure memorising we have almost adopted the practice of *no* memory work, and have most unpsychologically dethroned memory from its high seat. The writer has frequently been at a loss to account otherwise for the poverty of memorised material possessed by the average student-in-training. The result of this fear of memory work is bad, for the necessary data on which the reasoning powers can act are scanty; the foundations on which a real taste and a wide acquaintance with literature can be built up are too often lacking.

* Our esteemed contributor is evidently an anti-vaccinator—or is it vaccinationist? The Editor disclaims responsibility for his opinions.

* * *

A CORRESPONDENT points out that our note on Circular 709, concerning the future qualifications of head teachers, is open to misconception. We hasten to make it clear. The Circular says: "No person who is not on August 1, 1910, recognised as a certificated teacher will be regarded as qualified under Articles 9 (*a*) and 9 (*b*) (i) of the Code to be a head teacher unless or until he has either (*a*) satisfactorily completed a course of training recognised by the Board under the Regulations for the Training of Teachers for Elementary Schools; or (*b*) acquired such special qualifications as the Board can accept in lieu of such a course of training." This, of course, does not exclude from head teacherships untrained teachers who were certificated before August 1, 1910. But the proviso which follows should be studied in this connection: "It must be understood, however, that the introduction of this change will not preclude the Board, at some future date, from requiring that any teacher, whether he became a certificated teacher before or after August 1, 1910, must possess one of the above-mentioned qualifications in order to be qualified to be a head teacher especially of a large school." These insidious little clauses have a way of remaining unperceived, and then suddenly becoming practical politics. From a "large" to a "small" school the step is easy. And what is the definition of a "large" school?

An Explanation.

* * *

WE have received the first number of a new educational review—a French one. Its title is *L'Education*, and it is to appear quarterly. In the programme traced by the editor it is stated that the review will serve as an international medium, and as a neutral ground (politics are taboo) on which writers of the most different, even opposed, schools of thought will find a meeting-place and a ready hearing. It is to appeal not merely to the profession, but also to parents and the general public. Its list of contributors is a fine one, containing names of educationists well known in France and other Continental countries, in England, and in America. With such writers, and with so catholic a programme, it will go hard if the review is not a success. The plan of the journal is excellent. Each number will contain a section of original articles, another of criticism, and a third of news from all quarters. Teachers will find in addition a running commentary on new books and a bibliography of books recently issued and sent for review. Altogether it promises to be an admirable production.

A New Review.

NOTE.—The circular on the treatment of geometry briefly referred to in these notes will be fully discussed in our next issue.

The New Constructive Movement.

WHAT IS BEING DONE IN THE MOST PROGRESSIVE SCHOOLS TO MAKE THE PRIMARY TEACHING TOUCH EVERYDAY LIFE AT ALL POINTS.

SUGGESTIONS FROM AMERICAN SCHOOLS.

BY W. H. WINCH, M.A.

WHAT ought we to look for in descriptions of the educational work of other countries? I am not at all sure that we should all give the same answer to this question; but I am fairly sure that teachers, whatever they *ought* to look for, *do actually look* for accounts of foreign work and foreign methods which they can themselves apply under the conditions existing in their own schools.

I fear that many of us who go abroad to study the school work of foreign countries are not found very helpful when we come back. There is a subtle temptation to make out that what we have seen is something very exceptional. To some extent what we *have* seen *is* usually something exceptional. For we have generally been "toted round," and all the large strawberries have been carefully placed for us on the top of the basket. And if we but give our educational hosts the slightest indication as to the sort of strawberries we prefer, we just get drawn along to all those places where that particular kind of strawberry is grown. And in those places sometimes nothing else grows at all; but as we only ask for strawberries, we learn nothing of the lack of other fruit.

Metaphor apart, educational investigators are specially prone to seeing only what they like, and, worse still, to seeing the best work in what they like, irrespective of all other work. Then some of them come back—perhaps I have done it myself—and say, "There, that's how such and such a subject is taught in that country; behold and admire."

I do not deny that an account of the best work in any subject is very stimulating; but it is well to see what the other work in these schools in other subjects is like too, and I am not at all sure that an account of this super-work is the most helpful to others. To experienced teachers it brings lack of confidence and hostility; they do not believe it is fairly done—that is, with due regard paid to other subjects. It all reads a little like a daily paper whose confident ignorance expresses itself in something like, "The child should be taught to so-and-so, and so-and-so. In Germany," etc., etc. I need not go on; any reader can supply the blanks for himself.

I claim that I have tried to show a more excellent way. I have endeavoured to photograph the actual daily work of Germany and America. I give it with its excellences, with its faults, and with the conditions under which it was done. I repudiate altogether the notion that I am furnishing examples for teachers to copy in slavish imitation. I think some of the lessons I give are capable of being greatly improved upon, and are sometimes inferior to many given at home. But there are, even in these lessons, points of interest to experienced teachers—I am not writing for pupil-teachers or students in training—and the English teacher may sometimes well be placed in the position of critic. Sometimes—yes, of course, I mean sometimes only.

I have written the above paragraphs because I want my readers to understand that I am not going to hold up the manual work of the United States as something which Englishmen are to fall down and worship. I believe, and I have said, that ours is better than the American work. But I do not know how long that will be true. And America, though weak in the aspect of finish and accuracy, has even now many points in her favour, and—the greatest point of all—she sends competent people all over the world to find out the best that is done everywhere, and pays them well to go and see it and tell her all about it.

But at present my reader may learn from American manual training and drawing a great many things to avoid as well as to imitate.

Constructive work—when does it begin? In this country in the infant school; then there is a lapse in most cases, and by-and-by it is taken up again in Standards V., VI., and VII. of our senior departments. In America it begins in the kindergarten, mostly stops dead in the primary grades, and begins again in Grade VII. (our Standard VI.).

If we wish to trace with any care the general progress of manual work in America, we shall have, then, to commence with the work of the kindergarten. We say *the* kindergarten; but that is a misleading way of talking, for it gives the impression that kindergarten teaching in America is one and indivisible, based on the same principles and carried out by the same methods. Such a statement would not be so very false if applied to England; but in the United States to talk of kindergartens is to talk of schools holding allegiance to very different principles. Some of them—a terrible heresy—repudiate the Master, in verity if not in name.

But let me give an American account of the present position. This is how the matter was put to me by the lady superintendent of kindergarten in a normal school in Illinois.

The kindergarten party in America has split into parties—enthusiasts say into two parties, moderate people say into three. First, there is the Conservative party. In its opinion all the evils of the kindergarten of to-day have resulted from disloyalty and defection. "Back to the Master," they cry. "Let us follow Froebel and his works ever closer and closer." Then there are the Radicals. They say they follow modern psychology, and cast aside everything not justified by its teaching. "This party," said my informant, "has indulged in ridiculous excesses; so much attention has been paid to the impulses of the child that obedience and discipline and industry have suffered."

For a moment may I stop my narration to make one comment? I do not think the superintendent quite says what she means. Surely we *should* pay attention to the impulses of the child; it is only by knowing what these are that we can wisely guide him in the right path. But we ought *not* to gratify every impulse as it

arises, whether it be right or wrong. Modern psychology does not sanction that, though there are some passages in Froebel which read as if *he* did. Both these parties, however, according to my informant, like to consider the kindergarten room as an *imperium in imperio;* as self-contained, autonomous, and non-preparatory. Now, if human development is marked off in definite stages, of which one leaves off before another begins, and if every one *must* pass through the lower before he can get to the higher, then Froebelism is justified, and those people who tell kindergarten teachers to prepare for the senior departments may be wrong —they may be inviting us to slur over or entirely omit a necessary stage of human development. If we wish to know which side is right, we must go to the biologists and the psychologists of to-day. And if they cannot tell us all we want to know, we must wait till child study becomes a science.

Well, there is a third party which doubtless (as is usual with third parties) is said to contain the excellences of the other two. They study Froebel as modified by modern psychology—I am still using the words of my informant—and insist on the connection between the kindergarten and the primary grades. With them the kindergarten is preparatory; yes, and one more point —the primary grades are developmental. They ask that not only shall the kindergarten look toward the senior school, but that the senior school shall look toward the kindergarten. There is urgent need, they assert, for a continuance of the observational and manipulative work which forms the bases of a good kindergarten.

Personally, I should prefer to say *a* basis, for where otherwise is the literature of the kindergarten? But on the whole I agree with my informant. I have long hoped to see a *rapprochement* between senior and infant departments in England along these lines. Would it be unfair to the United States to express the opinion that England, with its infant schools, is at least as nearly on the way to achieve this *rapprochement* as America with its kindergartens?

But, after all, my reader may say, Why all this discussion about the theory of kindergarten? What has this to do with practical work in schools? I will try to show the connection.

We in England are all ready to admit that observational and manipulative work of value is done in most of our infant schools, and the "New Constructive Movement" would seem to many just an outgrowth of this work. But in the United States the kindergarten would not of necessity play the same *rôle*. There are two parties of kindergartners, cleft asunder not only by differences of ideal, but by very different systems of practice. One New York training school has *two separate* kindergarten practice schools, one for each party. There are a *practical* kindergarten school and a *symbolic* kindergarten school. Which is the lineal descendant from the Prophet it is not for me to determine; but it is asserted that the second is. I take some typical quotations from the symbolic school.

"The boy at six, with his rocking-horse, is trying to understand what God meant when He gave man dominion over the beasts of the field."

"Then the little pea said, 'I will go wherever the Great Father sends me to do His work.' He was put into the pea-shooter, and away he flew," etc.

There is a good deal more of this; but doubtless my reader sees what is intended. From that sort of kindergarten we should hardly expect to find much work which would be found useful on the strictly practical side. But we should be wrong in so thinking, for in kindergartens of this type there are usually exercises in paper-folding and in the development of shapes one from another; and if this is useful work, if this work is really preparatory to construction, then the symbolic Froebelian kindergarten is of value to the Constructive Movement, though we should not at first sight have thought it likely.

The other school of kindergartners, which my informant called the "practical" school, seems to stand by the "gifts," but thinks that "once in a while they should be administered in an unorthodox way." (I think the phrase "administering the gifts" is delightful: are they educational pills?) And one of the newer school, bolder than the rest, writes: "It seems to me that where we undertake to drill children into doing things, into folding certain geometrical forms, and doing that sort of thing, then you all have a right to criticise that kind of work."

Well, I suppose we all have a right to criticise any kind of work, provided we know enough about it and about the purpose it aims to fulfil; but I have inserted these representative quotations and descriptions because I can foresee that the rise of the Constructive Movement in England and the newer lines of teaching for very young children will bring the same questions before us here, and probably bring them in an intensified form. Intensified, because we cannot say, as an able American writer can say of his own country, "Between the elementary school and the kindergarten is a gulf which few teachers attempt to span." In our country our teachers are constantly trying to span the gulf. And, further, the growing tendency to co-ordination will involve much publicity, much consideration, and much discussion.

In any case, the kindergarten starts the practical work, and I shall follow it as far as I can, through the primary grades (in cities where it exists), through the grammar grades, through the vacation school, up to and including the manual training high school.

(To be continued.)

SIMPLE CONSTRUCTIVE WORK.

A SCHEME FOR THE JUNIOR CLASSES IN GIRLS' AND BOYS' SCHOOLS.

BY C. T. HUNT, DULWICH HAMLET L.C.C. SCHOOL.

ONE finds much special constructive work done both in infants' schools and in the upper parts of boys' schools; and as the present movement will chiefly affect the children and teachers in the latter, there seems a tendency to carry the lines of work backward from the wood and metal work, rather than forward from the exercises worked in the former. This is natural perhaps, because, unfortunately, the schemes of Pestalozzi, Froebel, and other great educationists, which form the basis, and determine the direction of the training of the little ones, have been neglected, certainly have not been practised, by the teachers in the boys' schools; and also, unfortunately, there have been doubts, owing to want of direct evidence, that children drawn from schools where wide systems of handwork have been followed, have shown a greater capacity for work, a greater liking for it, or a greater intelligence in attacking the more definite and responsible problems of the boys' schools.

Nevertheless the movement should be a forward one, for the manual and metal work are quite isolated spots of colour in the curricula of the schools.

Further, the movement must be crystallised in definite shapes, for an indefinite idea of making all subjects as practical as possible will lead to nothing. Having got so far, one will naturally determine a few principles on which to work.

1. The exercises must be varied, for a development of greater intelligence will be the aim rather than great expertness, which is the outcome of mechanical perfection.

2. The exercises must grow from one another, each teaching something new, but each linked with past work.

3. Drawing with Standard I. and Standard II. boys must follow the making.

4. Measurement, comparison, and other arithmetical problems must widen the usefulness of the work.

5. The exercises should require some exactness and proper proportion, even from the youngest.

6. The child should, wherever possible, choose shape, or size, or colour—in fact, do anything that will make him feel that the result is his own.

7. No chance should be omitted of allowing the resourcefulness of the children to come into play as regards methods.

8. The work should chiefly aim at training, but where things are made they should be of use.

The following are the suggested schemes of work :—

Standards I. and II. : (*a*) Paper-folding, and cutting with scissors ; (*b*) clay modelling ; (*c*) drawing, colouring with crayon or brush.

Standards III. and IV. : (*a*) Drawing ; (*b*) paper-cutting with knife ; (*c*) cardboard modelling ; (*d*) clay modelling ; (*e*) making of sections and drawing.

Standards I. and II. : Materials —(*a*) Shapes in metal and wood—circle, square, oblong, triangle. (*b*) Stiff brown and white paper. (*c*) Rules with inches, half-inches, and quarter-inches, and set-squares. (*d*) Pencils, crayons, brushes, and colours. (*e*) Clay or plasticine ; no tools. (*Note.*—The former is the better medium—more workable, can be constantly washed, and is cheap. The latter is dear, so small quantities are given out, and this results in petty work and modelling in wrong sizes. It can, however, be kept in bags or boxes, one for each child, and is cleaner in use. Unfortunately, the work done by both these materials will have to be constantly destroyed, so there is the bad moral effect resulting from making and breaking. Still, specially good work can be cast, and so given a longer life.) (*f*) Slates or boards on which to work.

A. *Paper-folding.*—1. Use circular pieces of brown paper. Fold so that the edges are close together. Open and fold again so that one end of the crease lies over the other. The circle is divided into four equal parts. Cut one out and prove. Compare one corner with the largest corner of set-square.

2. Fold as above. Measure lines from where the creases cross to edge. Fold over the curved edges of four divisions. A four-sided figure is the result. Measure sides and compare corners with largest corner of set-square. Drawing should be done (*a*) by marking round disc ; (*b*) by use of a pin, cotton, and pencil ; (*c*) by freehand. Colour with crayon or brush.

3. Use squares of brown paper. (*a*) Fold corner to corner ; (*b*) fold corner to opposite corner ; (*c*) fold all corners to middle, by folding opposite corners until they touch. Place shape on white paper, and draw round it. Drawing.—The edges of the squares will be recognised as lines which can be drawn, so let them be drawn, first full size, then half size, using ruler and set-squares. The creases on the paper leave lines ; let children find the exact position on the paper, and reproduce them as lines on their drawing. All kinds of measurements and problems will suggest themselves from these figures.

4. Use oblongs. Compare with squares. (*a*) Fold corner to corner in two ways. Four similar equal oblongs are made. Let one be cut out to test this. (*b*) Fold short side on long side. Fold extra piece back, and a square is made. (*c*) Measure points on edge and fold, producing various shapes. Drawing.—As with circles and squares.

5. From squares and oblongs fold and cut triangles. Drawing.—As with circles, etc.

6. Book-covers. Brown paper. Measure roughly with book. Fold down top and bottom. Show necessity for removing a portion from top and bottom. (*a*) Fold in sides. (*b*) Fold sides and tuck in corners. Drawing.—Draw from paper, putting in lines where creases occur.

7. Envelope. (*a*) Let children bring envelopes that have been unstuck. Lay out on brown paper. Mark round shapes. Cut shapes out and fold. (*b*) Made from squares of paper. (*c*) Made from oblongs. The latter large enough to make an envelope to hold drawings. Drawing.—Use paper full size and half size. Mark on drawing the lines corresponding to creases.

B. *Clay Modelling.*—1. With clay or plasticine make circles, squares, etc. Outline made by drawing round shapes or by freehand on slates or boards. Then complete figure by placing pieces one against another until the space be filled. Make surface level by adding small pieces where hollows occur, with thumb or finger, and then spreading. This is excellent training, for the fingers soon feel more than the eye can see. Care must be taken that the outlines are not made first. When the figures are finished, measure and draw similar surfaces of same size. With these little children all the work should be done with the thumb and fingers. Shapes and surfaces must be made by adding piece by piece.

2. Make cubes, prisms both square and triangular, building them up from slabs of given sizes. Use a midrib running lengthways of required height for triangular prism.

3. Make half ball—using semicircular ribs crossing, and filling in.

4. Make ball, on cube or square prism, so that children can add strip by strip, pushing with thumb or finger to complete ball. Children should determine size of ball before starting.

5. Half cylinder, lying. Use two semicircular ends and midrib of proper height.

6. Slab with corrugated surface.

Alternately with these more rigid objects the children should model the surfaces of long, blade-like leaves of the daffodil, tulip, broad grasses, and flags.

Let them build up a strip of clay of the required thickness, running in the direction of the leaf as it lies on the desk. Then let them model the top, copying the ups and downs and curls from the surface of the leaf. In the same way the surfaces of large, simple leaves like those of the laurel can be modelled.

This work must only be looked upon as quite preparatory—exercises given to make fingers, eyes, and brain alert.

"Magnificent Mr. Lucy."

MR. H. W. LUCY ("TOBY, M.P.").

(Frontispiece of the newly-published volume, *Sixty Years in the Wilderness*, by H. W. Lucy. By kind permission of the publishers, Messrs. Smith Elder and Co.)

IN order to enjoy the following story, it is necessary to remember that Mr. H. W. Lucy ("Toby, M.P.") makes up in influence what he lacks in inches.

Lord Charles Beresford, setting out on a trial trip in the *Magnificent*, invited the representative for *Punch* and patriotism to accompany him, while Mrs. Lucy was staying at Hythe.

"The trial being prolonged," we read in Mr. Lucy's new volume, "Lord Charles feared that my wife would be anxious at my non-arrival. Passing Hythe on the homeward tack, he brought the ironclad closer to land in Hythe Bay than battleships had floated since the Danes made their historic descent on the coast. The coastguardsmen on duty, hurrying to the beach at the unusual spectacle, were signalled to receive a message by semaphore. It ran thus :—

"'To Mrs. Lucy, Whitethorn, Hythe. From Lord Charles Beresford, *Magnificent*. Mr. Lucy will be home to luncheon to-morrow at 1.30.'

"Half an hour later the following message was delivered :—

"'To Mrs. Lucy, Whitethorn, Hythe. From Lord Charles Beresford. Magnificent Mr. Lucy will be home to luncheon to-morrow at 1.30.'

"Semaphore signalling does not take into account semicolons or full stops. To this day Lord Charles, writing to me, invariably addresses 'Magnificent Mr. Lucy.'"

The playful title was, however, not ill applied after all. Those who read Mr. Lucy's *Sixty Years in the Wilderness* will agree that for many reasons he merits it as a title of honour; for we have in this volume a modest record of a life in which grit and endurance have made "the wilderness" to blossom as the rose—as magnificent a feat as any man can hope to accomplish.

The author gives us many glimpses of celebrities whom he has met and known; but we confess that his own life, and especially the early portion of it, is most interesting of all. He began by being habitually late, and we hoped that he was going to prove the brilliant exception to the copy-book rule. A little later, however, we learn that he read Smiles's *Self-Help*, and reformed. We must own to a certain amount of regret at the disappointment, for we love to prove proverbs perverse. Our author, moreover, was a "rolling stone," and by all the laws of the copy-book ought to have gathered no moss—a dreadful fate! We are not in a position to say whether Mr. Lucy has gathered the equivalent of moss, but, like other rolling stones, he has obviously gathered polish, and, like the world-wanderer, he has learnt to "know men and cities."

Mr. Lucy's story of his fight for recognition as a journalist will doubtless cheer many a Fleet Street aspirant, and serve as a kind of *sursum corda* to future editors of the *Times* and the *Daily Mail*, who at present look with awe upon the fully-established office boys and the printer's *diaboli*. He had aspirations, too, after association with the Caines and Corellis, and instead of going to a literary agent, avoided a fee by appealing to a master of the art of light fiction.

"I wrote to Bulwer Lytton asking him to advise me, apologising for addressing him without being personally acquainted, mentioning in offhand fashion the certainty that some day we should 'meet on the ladder of fame.' I remember the phrase, because, shortly after I had posted the letter, it occurred to me that it was maladroitly expressed. Of course, if we were to meet on a ladder, as I would be going up, the author of *My Novel* would be coming down. I do not know whether the same idea struck and affronted Sir Edward Lytton. Certainly he did not answer my letter."

Students of politics, that "continual choice between two mistakes," will be keenly interested in the glimpses Mr. Lucy affords of the life behind the footlights of the stage at Westminster. Upon these matters we must, in this place, make no comment; but there are other delightful personal touches in this book upon which there is no ban. If we cannot all agree to admire Gladstone or (Mr. ?) Balfour, we can at least offer common homage to Burnaby and the manner of his death; to Henty, that idol of our youth; to Dickens, that fountain of perennial youthfulness; and to that "goodly fellowship" which is responsible for the weekly cartoon that makes high politics so plain that he who runs may read.

HISTORIC CARTOONS FROM "PUNCH."
(By special permission of the Proprietors.)

Our readers will find several of these cartoons specially interesting at the present moment.

> "Here let us sport,
> Boys, as we sit;
> Laughter and wit
> Flashing so free.
> Life is but short—
> When we are gone,
> Let them sing on
> Round the old tree."

The evolution of the *Punch* cartoon is probably known to most of our readers. "Gentlemen of England who live at home at ease," writes Mr. Lucy, "and get their *Punch* at the bookstall on Tuesday night or on Wednesday morning, doubtless believe, if they think about the matter at all, that at some late hour of the previous night the cartoon was 'knocked off,' and went to press just as if it were the leading article in the morning newspaper. As a matter of fact, it is designed exactly a week ahead. Peering through the clouds that hide the future, its devisers, with more or less of prophetic accuracy, attempt to realise how a particular question of the day will present itself a week later."

How certain historic cartoons came into being can be learnt from Mr. Lucy's interesting account of the *Punch* dinner. His comments upon some of the contributors are, however, just a little sad. The refrain seems to be, "Alas! poor Yorick! I knew him, Horatio, a fellow of most infinite jest... How he was wont to set the table in a roar!" Surely Mr. Lucy saw some of these giants in their prime. He half promises us another volume. May it come quickly, and may it tell rather of the "laughter and wit" than dwell upon the time "when we are gone." After all life is but short, and we shall be "gone" a very long time.

Robert Lowe is anathema to the true educationist. Mr. Lucy recalls the fact that he was a humourist, which perhaps explains a great deal.

> "I recall one example of Lowe's ready wit. The House was discussing an Endowed Schools Bill. Lord Sandon, joining in the controversy, delivered a bitter speech aimed at the Endowed Schools Commissioners. Before sitting down, it occurring to him that he might have gone too far in assault on constituted authority, he remarked that he had 'carefully fenced himself' against being understood to pass unfriendly criticism upon the commissioner. Lowe, following, quoted the remark with the commentary, 'There has been in the noble lord's speech more of railing than of fencing.'"

So spoke the man who has provoked more railing than any of his contemporaries, even those who were Commissioners. The humour was, however, somewhat thin, when you come to think about it.

NEXT MONTH.

A full review of Professor Allen's "The Place of History in Education."

Useless Education.

EDUCATION A FAILURE!

UNEMPLOYMENT AND PAUPERISM.

BY JOHN PERKINS.

BEFORE we proceed to the recommendation made by the Poor Law Commission, we need to inform ourselves of the facts and figures relating to unemployment and distress. The Commission unearthed the present-day condition of the labour market and the consequent pauperism. It would have carried us very little further if the report had dealt simply with things as they exist and made no recommendation as to the method of meeting the ills which were discovered. A diagnosis is valueless unless it is followed by a remedy; but the remedy may be worse than valueless—it may be positively dangerous—unless preceded by a careful diagnosis. This, then, is my excuse for presenting some of the findings of the Commission.

All of us have some hazy notion that the twin evils of unemployment and pauperism exist to a very considerable extent, but it is difficult to get at tangible facts and reliable figures to substantiate our beliefs. The report says: "Any investigation into the facts and problems relating to unemployment-distress and its relief discloses, as one of the chief defects of our present system, an extraordinary lack of accurate information as to the extent and character of unemployment.... There are no data which give any accurate idea of who and how many the unemployed are, and what is the duration of their unemployment."

The Board of Trade returns relating to about 600,000 trade unionists show 24,000—or 4 per cent.—to be without work; but "any attempt to apply the percentage to the whole ten millions of adult workers would give wholly untrustworthy results."

England's 800,000 Paupers!

One is obliged, therefore, to turn to the figures relating to pauperism, and although these may be somewhat illusory, since there is no periodically available information as to the character, industrial and moral, of able-bodied paupers, yet these tables contain much material for consideration. We find that on January 1, 1908, the number of persons obtaining casual relief was 17,083, and other classes of paupers, omitting the insane, numbered 798,898, or 22·9 per 1,000, or 1 in 44 of the population.

This total of 798,898 was made up of 221,022 men, 343,895 women, and 234,792 children. It is significant to note that 52·7 per cent. of the men paupers were in receipt of *indoor* relief, as compared with 21·4 per cent. of the women and 26·6 per cent. of the children. In fact, of the 252,618 persons treated indoors, no less than 116,463, or 46 per cent., were men.

Moreover, "since 1891 men have resorted to Poor Law institutions at earlier ages than formerly. Not only has there been a progressive increase in the number of men over twenty in receipt of indoor relief, but the rate of male indoor pauperism to male population of the same ages was higher in 1901 than in 1891 at every age from forty-five onwards."

"Some industries contribute to pauperism to a greater proportionate extent than others. The groups of occupations in which the rates of male pauperism are highest are those which afford only casual and precarious employment." Taking the general rate of pauperism for all male adults as 21·3 per 1,000, we find it to be 84·9 per cent. among general and undefined workmen and dealers, 40·3 per cent. in fishing industries, and 39·7 per cent. in agricultural callings.

On the other hand, "the industries in which skilled workmen are largely employed show lower rates of pauperism, but nevertheless an appreciable proportion of their workers come under the Poor Laws."

The Deterioration of the Able-bodied.

It is true that, compared with the early part of the last century, able-bodied pauperism has steadily decreased; but in 1834 there was no public agency for their relief other than the Poor Law; but "this state of things no longer prevails. The number of able-bodied applying for assistance to agencies outside the Poor Laws is far greater than those applying to the Poor Law itself."

On March 31, 1906, when pauperism was at a high level, there were approximately 13,000 to 14,000 healthy, able-bodied men in receipt of Poor Law relief. In the winter of 1905–6 there were 111,000 applicants to Distress Committees, of whom only 1,434 were women. In addition, a very large number of persons received relief from charitable associations, and besides these, probably many a deserving case went unrelieved. "It may safely be said that the number of able-bodied men in urban districts applying for assistance outside the Poor Law is much greater than the number of those who apply to the guardians."

Here, then, we have the gist of the statistics so far as they are to be ascertained, and they seem to demonstrate beyond dispute that there is too great an amount of able-bodied distress consequent upon unemployment and under-employment.

Unfortunately, the methods adopted in the past for alleviating or remedying this social canker have tended rather to aggravate than to heal the sore. "For those past childhood workhouse life is liable to have an actually deteriorating effect." One witness says: "After an experience of twelve years, there is no doubt in my mind that life in the workhouse deteriorates mentally, morally, and physically the habitual inmates.... A large number of cases has come under my notice of young persons of both sexes who on their first admission to the workhouse have felt their positions and surroundings most keenly, and yet in a very short space of time have found the life so congenial and free from responsibility and need of exertion that they made no effort to leave it.... I have also seen many young people admitted who were at first bright and willing to perform their light duties, but who soon grew lazy, and unwilling to do anything, though physically well able to work."

Another witness says, "Even men above the ordinary working-class appear to lose their manhood when they come into the house." Again, the able-bodied "easily become enervated and lose all desire to rise again to true citizenship and individual responsibility." So much, then, for the Poor Law as a remedial agent.

Much the same result is the outcome of such efforts as Municipal Relief Works and the Unemployed Workmen's Act. Small wonder, then, that the Commissioners examine for themselves the causes for unemployment, and suggest new remedies!

A Far Greater Problem—Boy Labour.

The report gives a review of the social and industrial development since 1834, and especially notes the modern growth, *inter alia*, of trade unionism, industrial combinations, municipal industries, and education. It goes on to seek out the causes for the existing evils, and in the forefront refers to the great prominence given to boy labour in the oral evidence and the investigators' reports. "The difficulty of getting boys absorbed, through gradual systematic training, in the skilled trades is great enough; but when to this are added the temptations, outside the organised industries, to enter at an early age into occupations which are not themselves skilled, and give no opportunity for acquiring skill, it seems clear that we are faced with a far greater problem than that of finding employment for adults who have fallen behind in the race for efficiency—namely, that the growth of large cities has brought with it an enormous increase in occupations that are making directly for unemployment in the future."

Casual Labourers and their Children.

This leads us inevitably to the closely-related question of chronic under-employment. The sufferers seem to fall into "three distinct categories: the casual workers, the seasonal workers, and the unemployables." For most men "*employment consists of a succession of jobs.*" There is a very general agreement among the witnesses that casual labour, itself often the outcome of ill-chosen boy labour, leads to the great bulk of unemployment. One says, "Among the most effective pauperising agencies must be placed casual labour."

The special investigators sum up the characteristics of the unemployed class thus: "We do not find that there is a very large proportion of men of bad character, but there are certainly a considerable number of men who are not very competent and not very industrious." So, then, it is often a question of moral backbone, for the report adds: "*Once a casual labourer always a casual labourer*, unless there is within the individual some special grit or force of character to emancipate him from his vicious and retentive environment."

The minority report serves to emphasise the demoralising effect of casual labour. After noting its tendencies upon the individuals themselves, it remarks: "Gravest of all, in our opinion, is the effect that this demoralising irregularity of life is having upon hundreds of thousands of children who are being brought up in the homes of the under-employed. . . . It is these children who, in the main, fill the industrial and reformatory schools. It is these children who furnish the 10 per cent. of 'regular irregulars' that are the despair of the public elementary school. Needless to say, it is these children who, in the main, when they grow up, recruit the ranks of unskilled and largely of casual labour."

"The Gravest of all Grave Facts"—the Daily Creation of the Unemployable.

Then we have the unemployables, among whom is classed the "able-bodied man of middle age brought up to and skilled in a trade which, through industrial changes, has become irregular or obsolete, and without alertness and energy to train himself in another skilled trade." Naturally, too, we have the "can't works" and the "won't works," as well as a number who have drifted from bad to worse. The minority report looks chiefly to the "misuse of boy labour" for the cause of much of this incapacity. "It is a moot point whether a large number of the unemployable become so in the prime of life . . . or graduate into unemployableness from adolescence. There is no subject as to which we have received so much and such conclusive evidence as upon the extent to which thousands of boys, from lack of any sort of training for industrial occupations, grow up, almost inevitably, so as to become chronically unemployed or under-employed, and presently to recruit the ranks of the unemployable."

The minority go on to say: "We regard the perpetual recruitment of the unemployable by tens of thousands of boys, who, through neglect to provide them with suitable industrial training, may almost be said to graduate into unemployment as a matter of course, as the gravest of all the grave facts which the Commission has laid bare. We cannot believe that the nation can long persist in ignoring the fact that the unemployed, and particularly the under-employed and the unemployable, are thus being daily created under our eyes out of bright young lives capable of better things, for whose training we make no provision. It is, unfortunately, only too clear that the mass of unemployment is continually being recruited by a stream of young men from industries which rely upon unskilled boy labour, and turn it adrift at manhood without any general or special industrial qualification, and that it will never be diminished until this stream is arrested."

Here, then, we have the root of much of the evil. The children leave the primary school and pass in large numbers into relatively highly-paid unskilled blind-alley employments, to find themselves approaching manhood with no living at their finger-tips. They become the casual workers, they drift into unemployment, and then the passage to the state of an unemployable is easy, as has been proved to demonstration.

What is the Cure?

We school people surely have something to say and to do in all this! Whether we consider the extent of pauperism, with its tendency to create the moral invertebrate, or study the amount of unemployment due to the lack of capacity, initiative, resourcefulness, and grit, we must needs confess that we still have a work to do. The report of the majority suggests four permanent preventive measures to meet this latter evil:—

1. Labour Exchanges. "A national system of Labour Exchanges should be established for the general purpose of assisting the mobility of labour."
2. The Education and Training of the Young for Industrial Life.
3. The Regularisation of Employment.
4. Unemployment Insurance.

The first of these proposals will directly concern us when we come to consider some system of After-Career Committees for primary school children. The last recommendation bears very materially upon the question of thrift, which is not always sufficiently considered in our curricula. The second suggestion affects us vitally, for therein are embodied demands which will necessitate very radical changes in our system and methods: the curriculum to be made more practical, the age of attendance exemption to be increased, improved

facilities for technical education to be provided, and some form of physical training to be continued after the ordinary school career. Here is food indeed for reflection, and I propose to elaborate the next point—the curriculum revision—in the next number.

THE VAN BOY.—II.

REMEDIES.

BY AN INSPECTOR OF SCHOOLS.

FURTHER study of the question of blind-alley adolescent labour convinces me that the wholesale condemnation of primary education by the Commissioners is unjustifiable. A more practical education *per se* would, I believe, be a mere drop in the ocean. Quite apart from the question of its bearing on the unemployed problem, I am enthusiastically in favour thereof, but that is another issue. We have the wind and tide against us. We must dig much deeper to unearth and close with the root causes. The rapacious maws of modern metropolises must be satisfied, and boys are sacrificed. Will instruction in carpentry and agriculture in desolate and decimated villages inoculate the strong, lusty country lad against the "virus" of the attraction of town life? Change the curriculum of town schools, making it much more practical, but you will not thereby keep lads from becoming messengers unless you can find equally remunerative and promising berths in the industrial world.

In the first place, then, as the problem appears to be largely a social one resultant upon the growth of thickly-populated areas and the substitution of such mechanical devices as the "grab," the "Scotchman," and the "iron man" for mere "brute" labour, let us discuss suggested remedies from this aspect.

To quote Canon Scott Holland, "If ever we are to 'build Jerusalem in England's pleasant land,' we must build the highway down which our boyhood has to travel from its fourteenth to its seventeenth year. If only we can catch our children as they pass out of the school doors, so that we land them self-possessed of their craft in the ranks of skilled industry by the time that manhood finds them, we shall have laid the foundation of social redemption." For really effective suggestions for carrying out these reforms we must turn rather to the Report of the minority than to that of the majority. The essence of their proposal is thus expressed: "We must shorten the legally permissible hours of employ ment for boys, and we must require them to spend the hours so set free in physical and technological training." The suggestions may be definitely summed up thus:—

1. No boy to be employed in any occupation below the age of fifteen.

2. Between fifteen and eighteen years of age no boy to be allowed to work more than thirty hours a week.

3. Their employers to be responsible for seeing that their young employees have their names on the roll of some suitable public institute giving physical and technical training.

4. The boy to be compelled to attend at least thirty hours a week.

The Local Authorities would be expected to provide the necessary institutions in places where they do not already exist. This halving of the total available amount of boy labour would have the advantage of helping to absorb the great surplus of adult labour, and so would deal directly with the social problem of under-employment.

In addition, the boys themselves would benefit, for there would be a scarcity of youths, and their rate of wages per hour would rise; but the total earnings would be less, and thus they would be more dependent on their parents. Moreover, more of their leisure time would be absorbed under discipline, and an improvement in *morale* ought to take place.

The physical training, which might include such recreative instruction as swimming, boxing, rowing, etc., would tend to correct the adverse hygienic conditions of town life.

Then the technological training, regular and systematic, through four or more years, would form a strong bias against *cul-de-sac* posts. As a well-known educational and social expert said in his evidence before the Commission, "We need not try nor even desire to convert every boy into a skilled engineer, cabinetmaker, or compositor. But we could make every boy, whatever his occupation, into a man of trained hand, eye, and brain, disciplined and good-mannered, of sound muscle and fully-developed lungs, with a general knowledge of common tools and simple machines, able to read a plan and make a drawing to scale, ready to undertake any kind of unspecialised work, and competent, even if he does unskilled labour, to do it 'with his head.'"

The next important remedy for curtailing this great sacrifice of boyhood is the organisation of industry by the State through a national system of Labour Exchanges, to which would be linked bureaus giving boys, parents, and all others concerned information and guidance as to suitable occupations for children leaving school. The school registry would be the connecting link between the life of school and the life of work. Its aim would be to supply that lack of deliberate choice which is the secret of so many false steps. The State supervision of the boy at work is the complement of the supervision of the boy at school. Some may regard these remedies as Utopian, in view of the fact that there must be some errand and van boys. The idea is, however, not to cut off entirely the supply of these. Large numbers of boys whose capabilities are uncertain, and whose minds are not made up, would be available for blind-alley work *for a time;* but the registries would, by retaining strict oversight of these, help such as showed leanings out of the *cul-de-sacs* into positions with prospects. Meanwhile there would be a gradual decrease in the available blind-alley berths by the absorption of adults.

This desirable *dénouement* will be accelerated by legislation preventing wage-earning by school children. We cannot restore the old apprenticeship system, even if that had anything like its commonly-supposed advantages. The tendency of the age is against it. It does not sort well with the rapid production, elimination of the personal factor, and elaboration of mechanical aids which are associated with modern industry.

It is generally conceded that the old apprenticeship training must be provided by the State in the form of trade schools. Indeed, in Germany and Switzerland such have been organised for some years past. The proposal to make attendance at evening continuation schools compulsory cannot be seriously faced until we legislate to compel the employer to afford facilities therefor. Experts are agreed that it is impossible for boys who are worn out by a whole day's physical toil to benefit to any appreciable extent by attendance at

evening schools. But the most telling argument in favour of the State stepping in to prevent this terrible wastage of its capital is the fact that, laudable as have been the efforts of religious, philanthropic, and other agencies, voluntary work has failed to do anything but touch the fringe of the evil. (See figures given last month.)

Side by side with the foregoing reforms of a social nature we must reconsider our methods of education, at least in the primary schools. We want to have more care for the *average boy*. The ladder from the gutter to the university is all very well for such of the brainy 5 per cent. whose parents can afford to make a sacrifice. An elaborate scholarship system, by encouraging cramming and bookish education, may defeat its desired end. In the first place, smaller classes will be necessary, for until you get down to the individual you will never produce intelligence. We may, therefore, anticipate some help from the recent Staffing Circular of the Board. Again, like teacher like child. How can one look for much mental alertness so long as thousands of the teachers have no recognised educational qualifications? The gradual weeding out of the supplementary teachers which has begun is, therefore, another step in the right direction.

Then undoubtedly there is need for a less academic education. We have too long been influenced by mediæval traditions, and in our usual conservative manner clung to the customs of the cloisters in educational matters until the child's school life has become quite divorced from his home life.

The Americans have, however, cut the painter of the monastic craft, and revolutionised the curriculum on Froebel-Pestalozzian lines. In a word, they have very largely forsworn the fetich of the mere pen and book, and introduced the powerful leaven of hand work.

Mr. Winch in his valuable articles demonstrates the truth of these statements.

This is not the occasion for defining precisely the lines which a more practical education should take. Moreover, it would be unwise at this stage, with the valuable contributions now being made in these pages to the general question, to attempt to lay down anything like schemes. Let us rather give thought to the matter and fully discuss it. In this connection there is one particular phase which is perhaps worth consideration. Recognising that "education's function is to prepare us for complete living" (Spencer), could we not more closely associate the outside life of the boy with the school life by more largely organising school journeys of a less ambitious character than is often attempted? For the older boys especially in town schools, why not, where feasible and suitable, introduce in connection with such expeditions training in camp life, cooking, judging distances, heights, and numbers? Then there might be instruction in such things as tracking and power of noting and memorising details far and near. Study of animals, birds, plants, stars, etc., from the actual objects, and only in a practical sense, might, too, be included. Boys engaged in beating for shooters often gain considerable experience, and enlarge their environment.

To sum up the remedies suggested, we have—

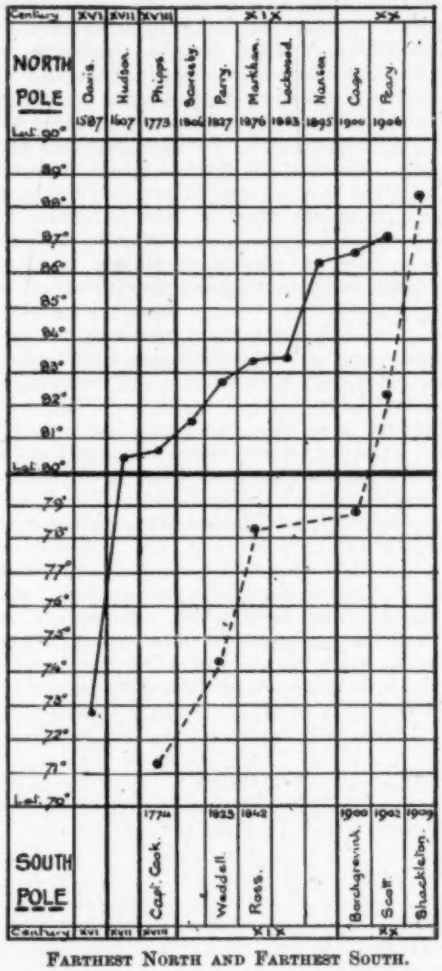
1. The halving of adolescent labour, and concomitant training for physique and mind.
2. Abolition of half-time and all labour by school children.
3. Organisation of industry and school bureaus.
4. Establishment of trade schools, and introduction of more practical subjects in primary schools.

GEOGRAPHY NOTES UP-TO-DATE.

BY E. R. WETHEY, M.A., F.R.G.S.

Farthest North and Farthest South.

THE annexed diagram over this title speaks for itself. Exploration in South Polar regions—viewed from the point of the Pole itself—has with one bound asserted itself over its rival of the north, and that, too, after having been for years hopelessly behind. Of course it was bound to do so. Bad as conditions are for travelling in Antarctica, they are much worse in Arctica.



Farthest North and Farthest South.

On the other hand, the initial stages of the north are far more accessible than those of the south. The Norsemen are supposed to have explored as far as lat. 75½° N. in Barrow Strait in the thirteenth century, and to have regularly hunted seal and whale up to 73°, or beyond the modern Danish settlement of Upernivik. Then, too, there was always the chance of discovering that wonderful North-West Passage to China and India, not to mention the English Government's offer of a £20,000 reward for this same discovery, plus another £5,000 to him who first reached lat. 89°. And so North Polar exploration had a long start. More than three hundred years ago Davis had penetrated nearer to the North

Pole than any of his modern Antarctic competitors had to the South Pole. Scott was the first to cross lat. 80° *south* in 1902; old Henry Hudson had antedated him by two hundred and ninety-five years in the *north*. And yet here is Shackleton, only seven years after Scott, surpassing all the giants of the north—Markham, Lockwood, Cagli of the Abruzzi expedition, and Peary—and practically getting in sight of the end of all things. He beats Scott by 340 miles, Peary by 70, and stops 111 miles off the Pole. Verily, as the South Pole telephoned to the North in *Punch*, "we shall have no privacy at all soon!"

EXAMINATION PAPERS.

A correspondent from Newfoundland, writing under the *nom de guerre* of "Matric. Student," wants answers to certain questions which have appeared in a recent examination paper (1908). Comments on up-to-date examination papers find fitting place in any up-to-date geography notes, so no apology is needed if occasionally such requests be granted in these columns. At the same time, no special claim is advanced here to provide "model solutions" to examination puzzles, for the human equation is often very pronounced in the genus examinator. *Quot examinatores, tot sententiæ*—and it would indeed be difficult to provide models to satisfy all schools. Some examiners prefer the "(1), (2), (3)" or "(*a*), (*b*), (*c*)" style, some abhor it, but all like anything that makes for clearness and compactness. To attain this end in geography there is nothing to beat rough sketch maps or diagrams, as *simple* as possible, and our Newfoundland student will be well advised if he cultivates this important art. Here are a few answers to his questions—"type" answers, perhaps, rather than "model solutions"—and we hope they may be useful.

Question I.—A Rain-Shadow.

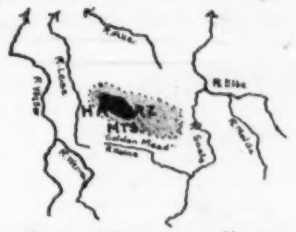
"What is a rain-shadow? How is it produced? Give examples from Central Europe."

A rain-shadow is the belt of relatively low rainfall on the lee side of a mountain system. Excellent examples in the British Isles are to be found on the east of Scotland, under the lee of the Grampians, especially in

THE RAIN-SHADOW OF THE EAST OF SCOTLAND

Rainfall over 40" 30"-40" under 30"

Buchan and in the straths of Dee, Don, and Spey, and on the east of the Pennines, the Welsh hills, and Dartmoor. Other world-famous examples are to be found in the lee of the Andes of Peru and of the Western Ghats in India. These dry sides of a wet patch are produced under the ordinary conditions of mountain slopes lying athwart the course of prevailing winds which have come from over the sea. In the Scottish examples the winds are west and south-west. They reach the highland masses of the country direct from the Atlantic, and after shedding much moisture (over 80 inches in the year in places) on the western upward slope, pass over to the downward eastern slope as *comparatively* dry winds: This dryness to leeward—the rain-shadow of the sketch map—tails off gradually from 40 inches to 30 inches, and incidentally accounts for the popularity of places like Braemar, where summer coolness can be obtained without excessive rain. Examples may be found anywhere in Central Europe where ranges of hills intercept the west winds. The Harz district will serve as a



THE RAIN-SHADOW OF THE HARZ

Rainfall over 40" 30"-40" under 30"

notable instance. On the western slopes the rainfall is often over 80 inches in the course of the year; to the east the rain-shadow, as in Scotland, shows 40 inches to 30 inches. Further south is the similar rain-shadow of the Thuringian Forest. The drier climate on the lee side of these two highlands is very favourable to vegetation, as witness the nursery gardens of Erfurt and the "Golden Mead" of the Helme valley. In the south-west of Germany the rain-shadows point north-east rather than east, for the winds that strike the Vosges and the Black Forest reach them by way of the funnel of the Rhone valley.

Question II.—The Importance of Certain Towns.

"Analyse the natural advantages and commercial importance of Hamburg, Lisbon, Milan, Prague, and Salonica."

Hamburg.—The natural advantages of Hamburg may be summarised as—(1) Position on the most south-eastern inlet of the North Sea, with deep enough water in the Elbe for successful navigation; (2) position near the mouth of a river affording water (that is, cheap) transport through the heart of mid-Europe; (3) special advantages over Baltic ports competition in (*a*) freedom from ice, and (*b*) tidal water.

No. (1) enabled Hamburg to seize its commercial opportunities as they came. The first was the discovery of the Cape route to the East by Vasco da Gama (1497–98), which, so to say, shifted the centre of trade from inland seas such as the Mediterranean and Baltic to the Atlantic Ocean. Hamburg, in face of the rising genius of Dutch and English seamen, was especially handy for the new age, and soon became an active scene of shipping. The second and greatest opportunity was the American War of Independence, and the consequent development of colonial trade. With the growth of America Hamburg has grown. Nearer home, the development of Bohemian and Saxon coal-fields and manufactures meant additional chances for Hamburg. A final opportunity came when the Suez Canal was opened, and it became convenient for European countries to deal direct with the East instead of through London as the middleman.

No. (2).—The Elbe is navigable right up to the German frontier and beyond, at least as far as Prague. As good

canal communication has now long been established with the Oder, the land area, or "hinterland," from which Hamburg draws its trade and commerce is of very great importance. The sketch map shows the chief towns of the hinterland, and comprises mid-Prussia, Saxony, Silesia, Bohemia, and Austria nearly up to Budapest—in other words, the very business heart of Central Europe.

No. (3) speaks for itself. Baltic ports are closed during the winter months, while the absence of tides makes them at all times difficult of access for large boats.

As to its commercial importance, Hamburg is far away the most important German and indeed Continental port. It is the only German port which would take a high place in a list of British ports. By some authorities it is placed fourth in the world's list of great ports—after London, New York, and Liverpool. It is especially the seat of a great shipbuilding industry, and has become, what always argues commercial prosperity, an important banking centre. Up the river go grain and raw material chiefly; down it comes a varied assortment of cargoes, of which sugar, coal, manures, and woodwork are most important. By reason of its triple advantage in access to a great sea, to a navigable river, and (by canals) to a second important river, it taps directly the trade of places as far apart as Magdeburg, Breslau, and Vienna. The importance of this may be gauged from the fact that not 20 per cent. of Austrian trade with the United Kingdom comes direct through Austrian ports, while 56 per cent. of it comes *vid* Hamburg. The recent development of the trade in cheap furniture made at Vienna from bent wood is another instance. This furniture goes all over the world, and most of it down the Elbe by the Austrian North-West Steamboat Company to Hamburg. Outside its immediate hinterland—as shown on the sketch map—Hamburg is also in a position (through the Kiel Canal) to tap much of the Baltic trade, and to compete with the United Kingdom in the race for trans-oceanic traffic by touching at such ports as Plymouth and Southampton. Artificial communications naturally follow waterways, and Hamburg's railway connections spread all over Germany. It had a double line of rail to Breslau long before Stettin had, though the latter town would appear to be the legitimate outport for Silesia.

Lisbon.—Two main geographical conditions have made Lisbon—(1) Its local position on the estuary of the Tagus, and (2) its international position between two worlds. The sketch map shows the importance of No. (1). The bottle-necked entrance to the harbour is curiously reminiscent of the Mersey at Liverpool, and is equally useful; for whether the tide be flowing or ebbing, the "bottle-neck" receives a thoroughly good scouring out. The harbour, therefore, though a river harbour, is not troubled with an obnoxious "bar," and it is obvious there is plenty of room. As to No. (2), Lisbon's position recalls that of Constantinople, but it naturally did not become prominent until the discoveries of the fifteenth century introduced a new world altogether to Europe, and at the same time showed a new route to the eastern part of the Old World. For some time after Vasco da Gama's exploit most Eastern products destined for Europe were bought in Lisbon; but as it was not well situated for distribution into the heart of the Continent, such ports as Rotterdam and Antwerp gradually robbed it of this branch of its trade. It, however, remained, and still does remain, one of the most important ports of call for South America or Africa. Therein lies its main commercial importance to-day. It has a great transit trade, for in addition to its marine commerce, it has by means of the valley of the Tagus—though the river itself is poor in the matter of navigation—tolerable access up to and across the Spanish plateau, and so finally to Paris and London. It has an Atlantic trade of its own, too, with the various Portuguese possessions, especially Madeira and the Azores. What Lisbon is to Portugal may be gauged from the fact that there are only two towns in this country with populations over 100,000—one is Oporto, about 170,000; and the other is Lisbon

itself, over 360,000. The next largest are little places of 20,000–25,000 like Braga. Its own specialities in trade are fruit and cork, salt from Setubal (the only important Portuguese mineral), and the general manufactures of a prosperous trading seaport.

(*To be continued.*)

SPECIAL NOTICE.

THE Editor has received two interesting and suggestive letters in reply to the article in last month's issue entitled "The Primary Curriculum as a Preparation for the Secondary School." These are, unfortunately, crowded out of the present issue, but will appear next month.

AGRICULTURAL EDUCATION.

A SCHEME OF WORK FOR RURAL SCHOOLS.

BY W. FRANCIS RANKINE.

Introductory.

IN no part of our national curricula is the need of adaptation of studies felt so keenly as in our rural schools, and, therefore, adaptation of studies will be the feature of the lessons that will be outlined in these columns from month to month. At the outset, it should be stated that didactic instruction in agriculture is not intended, but, on the other hand, an endeavour will be made to elaborate studies that will be useful to those teachers whose curricula differ materially from those of the truly urban school. Generally the scheme of work will embrace the consideration of the following heads: 1. The soil. 2. The plant and animal in their relations to the soil and to one another. 3. Human economy, so far as it is concerned by rural considerations. So far as it is practicable, the lessons will be seasonal, and correlations will be emphasised wherever they are deemed helpful. It is, however, impossible to evolve a scheme that shall be applicable to the needs of every district in our islands; therefore something must be left to the originality of the interested reader, and such a demand should prove invigorating.

Work for the Month.

For June the following studies are suggested:—

1. Soil study. Surface cultivation of the fields. How water rises in the soil. How water is conserved in the surface soil.

2. Plant study. Weeds. Why weeds are injurious to the interests of the agriculturist. The chief members of the weed family. How weeds are eradicated. Nature's equipment of the plant world.

3. Grasses. The chief hay-making varieties.

Soil Study.

Capillarity. How water rises in soils.—1. Water not only sinks through the soil immediately after rain storms, but also rises. This may be demonstrated by a simple experiment. Take several capillary tubes of varying bores, and place them in a pan partially filled with water. After a few hours note the heights to which the fluid has risen in each tube. It will be found that the heights vary with the bore of the tube; the smaller the calibre the higher the water ascends.

2. The next step is to show that the passages formed in the soil by digging and ploughing correspond to the capillary tubes; the more careful and thorough the cultivation the finer are the passages and, consequently, the higher the water will rise in the soil. This means that the surface soil will have a greater reserve of moisture for the plants which are growing in it during the summer. The greater quantity of moisture on which the soil depends is derived from rainfall, and this is stored in the lower parts of the soil. In this way a water table is formed, which, in other words, means the height at which the surface of the water lies under ordinary circumstances. The depth of this water table depends on the physical state of the soil. Thus in heavy soils, such as clays, the table is but a few inches below the surface, and in light soils, such as sands, the table is deep. With mixed soils the depths are varying. In this direction an interesting experiment will reveal results that are valuable. Obtain supplies of pure sand and also plastic clay. Take three lengths of wide bore tubing, and in the first pack pure sand, in the second place the clay, and in the third mix equal portions of clay and sand. Place these three tubes in a pan of water, and note to what heights the fluid ascends in each.

However, there is another force at work in the soil which must receive attention, and this is the evaporation that goes on continually on the surface. The rate of evaporation depends partly on the physical state of the soil and partly on the heat of the sun. Thus the moisture of the surface soil is extracted by this movement more in the summer months than at any other time. And it is at this time that the growing crops require a reserve of water supply to feed their roots. However, as the evaporation progresses, the moisture supply of the water table is called upon, and, rising to the surface soil, it is lost so quickly that it is of little benefit to the plant. This loss is prevented by forming what is called a "mulch" on the soil around the plants. This means that the soil is made very fine by hoeing operations. In the fields where roots are growing this operation is of primary importance, and is generally carried out in June. Not only does the hoeing remove weeds, but it also conserves the moisture of the soil by creating a fine condition of the surface soil.

The relation of capillarity to surface cultivation will be referred to next month.

Plant Study.

Weeds. 1. *General.*—Incidentally, a weed may be described as a plant which is useless to the economy of the farm or garden. Really it is a plant in the wrong place. Its vagaries are well known to those who have real knowledge of the work which is thrust upon most farmers in maintaining equable conditions for their crops. No attention need be paid to the weeds that spring from indifferent samples of seeds; these are generally referred to as relative weeds, and little is left to the farmer to reverse the injury they work. On the other hand, absolute weeds, which owe their introduction to the ways of Nature, form the subject of this lesson, and rural teachers will have little difficulty in obtaining specimens for the classroom from the field. In field and garden those conditions which favour plant growth appear to promote particularly the development of obnoxious plants; also in the hedge, woodland, and meadow the weed plants experience every influence that makes for their perfection. At first sight it would seem that weeds are not subject to classification. This, however, is not true, for it will be found possible to arrange them in distinct classes, side by side with the floral specimens that usually find admittance to the Nature scheme. Elaborate detail in this direction would occupy more space than is at our command, and accordingly further elaboration must be left to the teacher.

Particular interest may be imparted to the study of weeds by taking note of their value as indications of soil characteristics; it should also be carefully observed how the habitat of each weed is influenced by the nature of the soil, presence of shade, marshy state of the land, etc.

2. *The Injurious Nature of Weeds.*—Generally the weed endeavours to secure conditions that are ideal for plant development, of which the chief are air, heat, moisture, and plant food. Therefore, unless weeds are systematically suppressed, the crops in the fields are deprived of these elements. It is on account of this

fact that the weed becomes a serious conflicting force in the economy of the farm. Naturally, in this respect some weeds are more harmful than others; much depends on the height of the stem, the extent of the root system, and habit of seeding. Most weeds develop one or so of these points very perfectly, and thus maintain their supremacy in spite of human efforts to remove them. Tall growing weeds such as thistles usurp a great amount of sunlight as well as moisture and plant food; climbing weeds, such as bindweed—the convolvulus—carry on these functions with the addition that the plant around which it entwines itself is considerably weakened. The most important points in the injurious nature of weeds may be summarised as follows :—

(1.) They occupy a great part of the space assigned to crops. (2.) They assimilate a great amount of the plant food in the soil. (3.) They utilise the greater part of the moisture in the surface soil. (4.) They prevent cultivated plants from securing sufficient sunlight and air. (5.) They frequently harbour insect and fungoid pests.

3. *Some Common Weeds.*—These plants afford numerous lessons, since several of the commonest weeds are admirable examples of specialised development in the plant world. The chief of these are given in a list below, and reference will be made to some of them in detail in a future paper. The best plan is to collect complete specimens of the plants to be studied and mount them, taking special care to secure seedlings, well-developed roots, seeds, and seed-cases. Thus the complete history of each plant may be demonstrated in all its phases. The following specimens are especially suitable for such procedure: thistles, charlock, coltsfoot, grasses, crowfoots, and dodders. Much valuable information is obtainable from the following leaflets issued by the Board of Agriculture and Fisheries: *Weeds and their Suppression*, No. 112; *Some Common Thistles*, No. 166; *Destruction of Charlock*, No. 63.

GRASSES.

The grasses constitute a large family of plants, and contribute many useful crops to the farm. Cereal grasses include wheat, barley, oats, and rye. Fodder grasses are represented by the numerous varieties that are grown for hay. The following outlines indicate the chief lessons that are suitable for the present month :—

1. *Roots.*—These are fibrous and frequently well developed. Germinate a few seeds of wheat or barley, and develop the seedlings in culture solution. Note the appearance of the first roots and the subsequent development of another set of roots at the node above the seed. It is at this stage of development that the crops are rolled in order to press the soil around the roots.

2. *Stems.*—In cereals and fodder grasses the stem is cylindrical and hollow between the nodes. Thus the stem is rendered strong, while a minimum amount of material is used in its construction.

3. *Leaves.*—These are long, parallel veined, and sheathe around the stem. Notice how and where the new growths develop.

4. *Flowers.*—At this period the flowers of the grasses offer a seasonal lesson. It will be found possible to collect several of these for examination under a lens. Note the protective glumes and feathery stigma particularly. Observe the development of the pollen and its removal by the wind to the stigmas. This is an example of wind pollination.

The study of these interesting plants may be carried out during school walks. Specimens should be collected and pressed for mounting on large cards.

OUR PICTORIAL SUPPLEMENT

COMPETITIONS

- FOR -

SCHOOL PUPILS.

In connection with the picture of Portsmouth Harbour presented with this issue of the "Practical Teacher," the Editor offers for competition among school pupils the following prizes :—

I. A JUNIOR PRIZE of Five Shillings for the best short description of the Contents of the Picture. Competitors to be ten years of age or under.

II. A SENIOR PRIZE of Half a Guinea for the best essay on the Naval Harbours of Britain, with special reference to Portsmouth and Rosyth. Length, about 600–1,000 words.

In each case Competitor must give, *at the head of the paper on which the essay is written*, (1) Name, (2) Age last birthday, (3) School address, (4) Name of head teacher. Two exercises may be sent in with each Coupon, for which see the back cover of the *Practical Teacher*. Winners will be asked for photograph for insertion if no objection is made; but teachers are requested to note that pupils who cannot furnish photographs must not therefore be deterred from entering the Competitions. Each essay must further be headed with a small drawing of the battleship shown on the back of the Supplement.

Essays must reach the office of the *Practical Teacher* not later than June 10, and must be addressed to the Prize Editor.

Our Art and Handwork Section.

PAINTERS AND PICTURES.

BY W. E. SPARKES.

VII.—J. S. SARGENT, R.A. VIII.—J. M'NEILL WHISTLER.

GREAT PORTRAITS.

WHAT constitutes a great portrait? An accurate representation of features so that the person may be instantly recognised? Only this and nothing more? To canvass the first twenty wayfarers on this matter (after the uncomfortable habit of certain Greek philosophers) would be to invite expressions of opinion distressing to the portrait painter. There is a large public which, conceding worth to the painted portrait on the score of its colour, looks upon it as an exercise in manual dexterity far less satisfactory in its results than the permanent photograph, and predicts a happy dispatch for the artist when once science can compel nature to leave her tints as well as her forms upon the sensitive plate.

"ELLEN TERRY AS LADY MACBETH." (J. S. SARGENT, R.A.)

In the same light, mechanical music has also its votaries; the tunes ground out from a piano by means of an ingenious contrivance claim a precedence by reason of their absolute accuracy in time—an accuracy probably beyond human skill. Since the great masters may be purchased in bulk, why trouble to listen to a pestilent human performer who obviously may be caught tripping in the most intricately difficult passages?

Mr. Samuel Butler in his masterly book * shows the Erewhonians, in their terror of machinery, condemning inventors as malefactors. This, however, had come about through the writings of an ancient philosopher of Erewhon, who had pointed out with pitiless logic that machinery already demanded its human slaves; that it had its whims; would labour when it pleased, or would skulk and sulk if put out of humour. "Why," pursued the philosopher, "should not this latent obstinacy, this elementary will, develop alarmingly (as machinery develops with astonishing swiftness) until all Erewhon be dominated and ruled in strict order by merciless, intelligent machinery? Wherefore, away with the accursed thing before its smooth-running power enslaves man's will!" A pretty parable in which the author probes deeper than would appear at the first glance into modern civilisation. The Erewhonians would have tolerated no mechanical music, foreseeing, as they would have done, the human slave humbly obeying the machine, bound down ignominiously in public to make a holiday sport. They would argue that each man has his free soul, coloured by habit and temperament, and that while man regards his fellows with unbounded interest, seeing in humanity Carlyle's "true Shekinah," he must seize upon and grasp with hooks of steel every manifestation that overtops the ordinary and commonplace—finding in such excellence the boundless capability and nobility in mankind, buried though it may be under sordid rubbish. "What a piece of work is a man! How noble in reason! how infinite in faculty! in form and moving how express and admirable! in action how like an angel! in apprehension how like a god!"

It was the greatest poet who said that, a man who knew all the notes on the gamut of human passion.

The Erewhonians would have expected various treatment from various performers. They would have welcomed not mechanical, monotonous accuracy ground out in an outrageous round; but individuality, change, intricate interplay of moods and passions, simulated and real, all dancing lightly like sprites, at the touch of the keys.

And such accuracy as the photographer adores may well be fit companion for machine-made music of the cylinder, differing by a whole world from the "music of the spheres." The portrait painter and the musician give us not only a picture or a "harmony of sweet concord," but they give us *themselves*; and the personality behind the show is worth more than the shadows flung on the screen.

The Erewhonians foresaw the doom awaiting machine-ridden communities, where the iron of the piston-rod enters into the soul These mythical people (as foreseen in vision by the Erewhonians) would be obsessed by machinery until all human endeavour should be as valueless and unmeaning as those means by which man reveals himself most intimately and yet with the finest shades of delicacy—in the various arts.

* *Erewhon.*

They foresaw, no doubt, a visionary country where art and music should become entirely mechanical; where poetry and drama should have no place. For what, after all, is art in painting, music, and the drama? Why not reduce all things to their simplest terms? *Macbeth*, as reported in the *Inverness Times* of the period, would be much less prolix than in the play.

Why should we prefer Shakespeare to a newspaper report, if not that the poet paints with infinite skill the infinite variety in mankind? The portraiture is complete, though certainly men and women never uttered such words. But the artist-poet has taken the poor dry twigs of their everyday speech, and in his hands they have blossomed like Aaron's staff. The substance is there—the lineaments of the men and women, but with certain lines that mark their character emphasised, and other lines softened. The handicraft that does this is so marvellously supple; it bends and sways and changes in action with every change in surface; it is a living fire running through the burning lines, or, lightly glancing, playing with delicate grace in lowly comedy, like a will-o'-the-wisp among the grass and wild flowers.

And surely these are the features and this the method of fine portrait painting. The main lines must be there, yes; but there must be emphasis and suppression; character must show, for the soul is higher than the body; and there must be style—the revelation of the artist. Indeed, as the interests in art advance, one scarcely gives a thought to the subject, but all is swallowed up in the artistry. One does not ask, "Who is this?" but rather, "What artist painted this?" and even this becomes merged into a more impersonal question still, "How has the artist (who he may be is of little moment) accomplished his task?" One distinguishes portraits, not as a Pope Julius II. or a King Philip IV., but as a Velasquez or a Rembrandt, the historical interest being overshadowed by the artistic. It may add piquancy to the picture to know that the two portraits reproduced here are of Mrs. Whistler and Ellen Terry; but in a very few years men will cease to regard this, being moved indeed entirely by admiration or otherwise for the painter's skill.

"Ellen Terry as Lady Macbeth."

(By J. S. Sargent, R.A.)

If, as the ancients said, a man is revealed in his style, Mr. Sargent has an amazingly robust temperament, vigorous, decisive, and courageous. But his dashing craftsmanship is founded on the solid foundation of long and searching study from present and past masters. Standing before his canvases, one recalls French artists, it may be through some slightly theatrical pose, or the drawing and turn of a hand, and this particularly in such subject-pictures as his "David in the Camp," or "David playing before Saul." Yet he has confined his attentions to no one school: severity in drawing in one place shows his indebtedness to the Romantic school, while a more dainty passage takes the thoughts at a bound to Watteau, Pater, Frognard, and the charming if frivolous Pompadour and her court. But undoubtedly he owes most, so far as his French indebtedness goes, to those later schools, dating some seventy years back, when her artists threw aside pretty artificialities and took all nature for their field.

These schools were particularly strong in fine draughtsmanship, for which their fame became European. Mr.

Sargent's masterly drawing may be traced to his apprenticeship in Carolus Duran's studio in Paris, a school that attracted artists from all parts thirty years since.

Mr. Sargent was born in Florence of American parents; he early showed a taste for art in a city noted for its collections of Italian pictures dating from the best periods. In Carolus Duran's studio he followed strictly the training offered by that accomplished painter, learnt to master completely his materials, and became a strong craftsman. That he should show French tendencies in both drawing and colour was to be expected, for Mr. Sargent has always accepted patiently what is good from all countries, though he makes his own use of these, and absorbs or rejects as it pleases him.

But among the pictures he had studied at the Louvre during his apprenticeship none appealed to him with such force as Velasquez's. As soon as possible the young artist betook himself to Madrid, where, in the Prado, he could study to his heart's content those breathing canvases that fill modern artists with delight and despair. Again, it was not to be expected that so receptive an artist as Mr. Sargent should not apprehend essential beauties in Velasquez's portraits, or that this should cease to show itself in his after work. Not that he became a mere echo. His inborn American shrewdness, tenacity, and vivacity prevented his degenerating into plagiarism: it is all to his honour that while showing influences derived from foreign art, he should sound a note so distinctive that some critics already place him among the original men who mark the progress of art as milestones along the road.

This portrait of Ellen Terry shows him in a somewhat unusual light. As a rule his men and women are calmly sitting or standing with arms inert; but as his object in this portrait was to paint at once a lady and an accomplished actress, he selected a moment, supreme in interest, that should lend itself to his purpose. It will be remembered, by those fortunate enough to have seen the actress as Lady Macbeth, that she followed the modern reading, in which Lady Macbeth no longer appears as the screaming, tearing virago, so dear to a transpontine audience, who compels her husband by mere stunning invective to become a murderer against his better nature. Ellen Terry pictured a somewhat delicately-framed but highly ambitious woman, eager for distinction and power, not from a savage delight in display, but from an inborn dignity that could brook no superior.

The artist selects the moment when, after all the crimes that followed thick on Duncan's murder, the unbending queen at length with gleaming eyes places the crown on her head. The act is expressive; by her own act throughout she has gained her ends.

"Portrait of the Artist's Mother." (J. M'Neill Whistler.)

In considering the portrait as a work of art it is unfortunate that the reproduction is so poor. The drapery especially has been badly cut up on the block—butchered as one might say; but enough remains to give some idea of the fine drawing, especially in the face and hands.

Vigour, breadth, and wide knowledge are all evident in Mr. Sargent's slightest work. He gives one the impression of a highly-trained artist who knows precisely what he wants, and has the ability to accomplish it without difficulty, a readiness he owes to his thorough training under Carolus Duran.

With him "finish" means completeness, not meticulous care for detail. He secures it by broad, unhesitating handling, with large brush strokes, following the methods honoured by Velasquez and Rembrandt;

details are lost in essentials, a light touch here and there precisely expressing the sheen either on the hair or on the glittering ornaments. A silver buckle at a given distance looks merely like this bluish-white dab of paint; why, then, draw the outline and put in every detail which can only be seen on close inspection? This is utterly opposed to the pre-Raphaelite practice, but it would be a dull world if all thought and acted alike, and particularly in the arts.

Mr. Sargent finds delight in catching the play of light changing infinitely as it falls on materials; impalpable itself, but magical in its marvellous transformations. He delights in difficult drawing where foreshortened limbs give opportunity for masterly interpretation; he has the knowledge to resolve the most abstruse problems where light masks outline, and memory must supply the details lost to the eye. In "Ellen Terry" the hands offer scope for fine treatment; it is astonishing with what ease the graceful forms have been maintained, though the fingers are to be felt rather than definitely seen. Presenting at least as great a difficulty is the head thrown back, the features particularly calling for a sure hand and a sure eye when seen at this tilt.

But masterly drawing and supreme success with colour and light are not the last word to be said in relation to any portrait; there must be character and soul. Mr. Sargent has been accused of being brutally frank; yet in this he follows his ancient masters, who, often enough, painted the most amazingly uncomplimentary portraits, apparently without raising any anger in their clients—clients, too, who were very razors for danger, and needed, one would think, as careful handling as an edged tool. Yet Pope Innocent X. accepted his malign portrait without a murmur! Had he been a modern client he would most probably have asked for less art and more personal beauty.

Mr. Sargent, like all fine portrait painters, is concerned only to give a living likeness, and if this involves exaggeration in particulars, as it seems to do, this is because the artist is, perhaps unconsciously, emphasising those traits which indicate character. He has been accused of being cynical; of delighting in exposing, in his unrelenting fashion, the unpicturesque phases in mental habit which a man might reasonably ask should not be handed down in a terribly truthful manner to his descendants.

Mr. Sargent, like Rembrandt before him, paints hands superbly in keeping with the face. In the Dutch master's etchings you have a perfect mine of character painting which you may almost as well read in the hands as in the faces: small, delicately-chiselled hands in keeping with thin intellectual heads; the short and hard-working hands and square, vigorous faces; the loose, thick lips in keeping with soft sensual hands—a whole treatise on the physical marks of mental and moral complexion.

"Portrait of the Artist's Mother."

(By J. M'Neill Whistler.)

Mr. Sargent's art is generous and full-blooded, outspoken and manly. It strikes like strong concerted music, harmonious in composition, lively yet scholarly in its melody both in line and colour; the drapery hangs in fine folds, the material is magnificently rendered. He experiments without ceasing, yet always in a scholarly and scientific manner; his portraits are convincing, lifelike, and, in one sense, decorative, though this latter quality shines out with more luminous effects in such paintings as "Carnation Lily, Lily Rose," where the Chinese lanterns and the gorgeous flowers combine their colours without a single harsh note. His art calls for instant appreciation or for violent opposition; there can be no middle, half-hearted course in judging such a virile personality. For he has his detractors in plenty, who find him cynical, without grace, blatant, and contrast him, unfavourably, with the sober British painters, Reynolds, Gainsborough, Romney, and Raeburn.

Whistler belongs altogether to another world. An American too, he received his art education in Paris, showing French influence particularly in his early etchings. But whereas Mr. Sargent is forceful, Whistler is delicate and sensitive, as though feeling intensely along the living lines. His art is seriously based on the study of great pictures, but it contains a note at one time new to European art, though now common enough—the decorative treatment learnt from Japan.

He is known more intimately for his etchings and "harmonies" in oil and water colour than for his portraits, though all alike are instinct with a vibrant sense of beautiful colour; poetic suggestion more than detailed or emphatic statement, together with a feeling for atmosphere. At first misunderstood, his harmonies in blue and gold (such as, for instance, his "Putney Bridge," in which the bridge, the river, the boats, and a few figures are all alike steeped in a glorious blue tone, touched here and there with golden spots shining in the heart of it, where the lamps and their reflected light harmonise completely) called forth violent dislike—a dislike that increased fourfold with the publication of etchings such as the "Venetian" series, in which a few broken lines did duty for the minute and meticulously careful lines until then common in French and British art, as well as in the older plates wrought by Albert Dürer, Van Dyck, and Rembrandt. This unthinking opposition roused Whistler to waspish retaliation. His sensitive nature chafed under the attacks; he had a lawsuit with Ruskin; quarrelled with his friends; wrote trenchant pamphlets (which, however, contain brilliant passages on the meaning of art); and wore himself out with incessant fighting.

Yet this waspish character, as it seemed to the public, had the merits of its faults. It was sympathetically moved by every exquisite manifestation in nature and art (and particularly in art, for his phrase was, "Nature is seldom altogether right"); he had depths unsuspected by those who called his art trivial, unscholarly, superficial. True, his drawing of figures is utterly unlike the manly, massive draughtsmanship of such powerful painters as Mr. Sargent, yet his few portraits strike a new and personal note which places him apart; they are original in outlook, finely if not strongly felt, and are essentially decorative. He was not to be compared with the great portrait painters in his craftsmanship, which is along a totally different plane; but his portraits are nervously full of life, and sympathetically rendered. In proof of this, no finer example could be given than the present portrait. The reticence, the quietly subdued harmony in tone, is instantly felt, and this is perfectly in keeping with the quiet face and delicate hands. In place of sweeping draperies, there are here the simplest and severest lines; the spacing is admirable, the "quality" harmonious. It would seem a daring innovation to introduce that severe picture-frame, yet how delightfully it calls attention to the head of the portrait, and how well the other frame, partly seen, helps to keep the composition steady.

Whistler had been accused of light triviality. He responded by taking the butterfly as his sign-manual; he said the most pungent things and painted the most brilliant little designs quite in keeping with the butterfly as it appears in one of his pamphlets—a butterfly with an unconscionable sting. Yet in his portraits he showed how severely simple and effectively studious his art was in reality. He relieved the sombre dress by the white cap and collar, as well as by the wide margin to the prints on the wall; he brought in a gayer tone by hanging a lightly-flowered curtain that just gives that added brightness so necessary to relieve the straight, dark perpendicular and horizontal lines so striking in the composition. This is the true decorative instinct applied to portraiture by an artist who was above most men instinct with the feeling for decoration, a truth that shows itself as much by his omissions as by his emphasis. Art is catholic; truth is many-sided. No one can say of any painter that he comprehends all the universe of art: he has explored this or that continent and seen it under bright or dull skies; but another discovers other lands, or finds in them treasures that have escaped other travellers. Each brings his report, but even that is partial, limited by his capacity for seeing and appreciating, bound in narrowly by the limits of his temperament. Mr. Sargent's art and Mr. Whistler's art are not opposed; they are differing statements of a truth which is illimitable; they each reveal new beauties before only partially seen or imperfectly stated by other men.

THE HISTORY LESSON AND DRAWING.

BY W. H. ELGAR.

II.—THE ROMAN PERIOD.

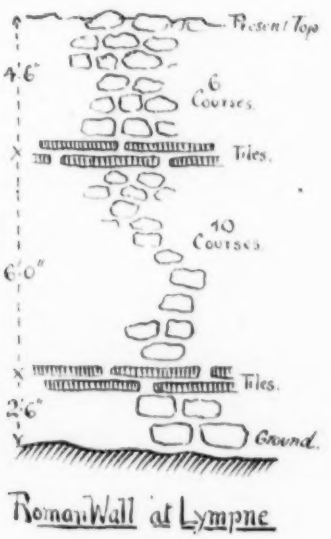
THE difficulty experienced in the introductory chapter—namely, of keeping in mind that drawing is our subject, and at the same time saying sufficient about the objects illustrated to create an intelligent interest—is even more felt in approaching the Roman period.

Roman work is so individual, and yet so capable of almost universal application, and has left so indelible a mark upon almost all our arts of peace and war, that much must be entirely ignored and only very little even lightly touched. On the other hand, we remember *what we do* so much better than *what we read*; so that probably the sketching of one piece of Upchurch ware will more easily convince a child of the reality of the Roman influence in Britain than pages of literary matter.

It is very probable that before long reading books treating of the everyday life of the previous inhabitants of our country, and of the objects with which they surrounded themselves, will appear, and will doubtless do a great deal of good; but half at least of their influence will be lost if they do not lead to actual study of the objects themselves.

The Roman work that has come down to us undoubtedly shows them to have been masters of constructive methods, and to have had great knowledge of materials and of the human figure. Of course we all know that their best artists were Greeks, but that fact does not by any means take away much from the above general statement. It seems that a more thorough realisation of these fundamental principles would do no harm to our general art education.

FIG. A.



Roman Wall at Lympne

FIG. B.

In their great engineering works, the Romans seemed to be able to make use of the materials at hand to a large extent; a precedent that perhaps might be more often followed than it is. When small stones were available, they made their wall of considerable thickness, using well-made mortar and bonding, with courses of tiles often six feet apart, as at Lympne (Portus Lemanus), Richborough, and many other places. They were equally at home with large stones and with unequal ones. This, of course, is not exactly drawing as it is generally under-

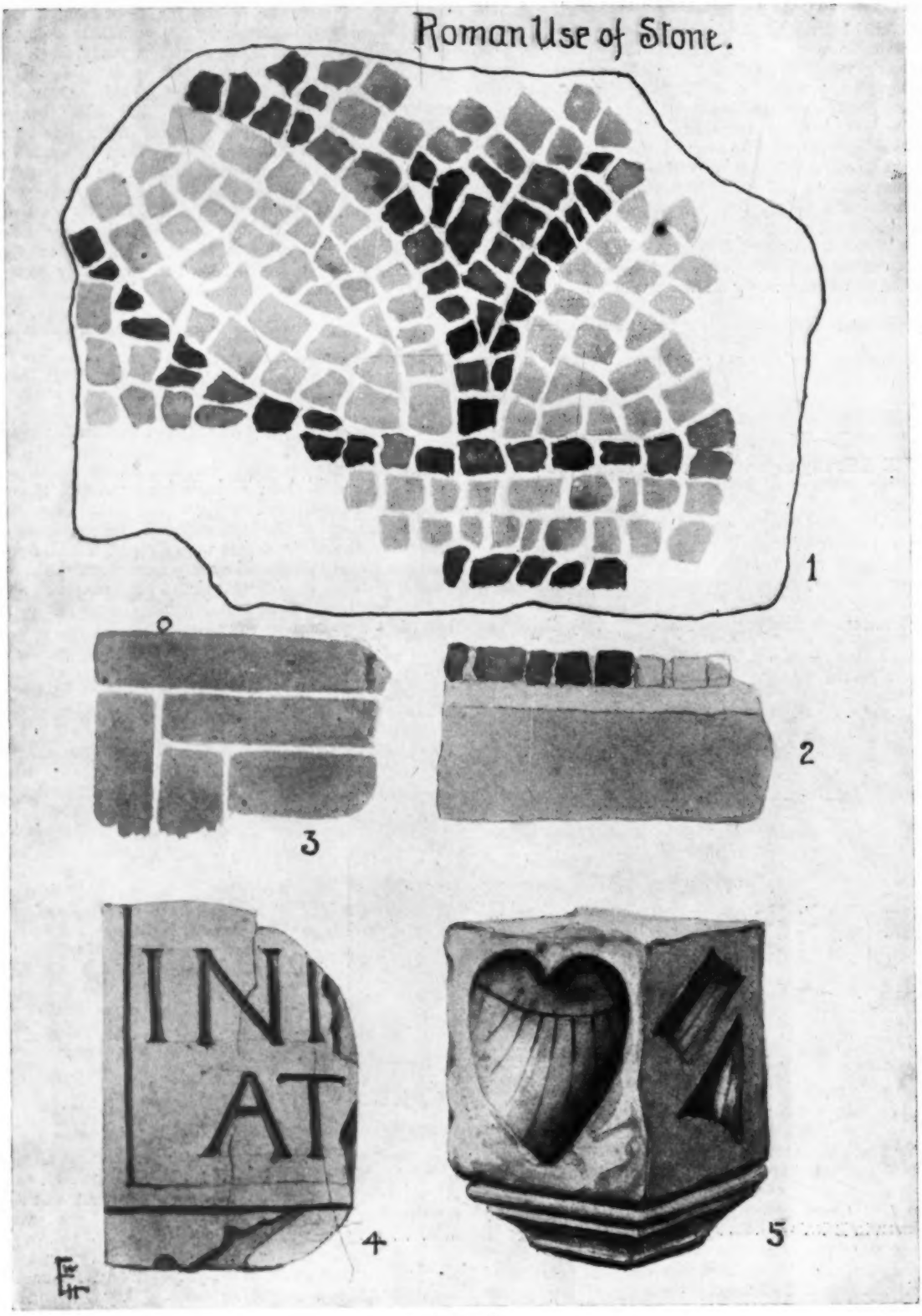


PLATE I.

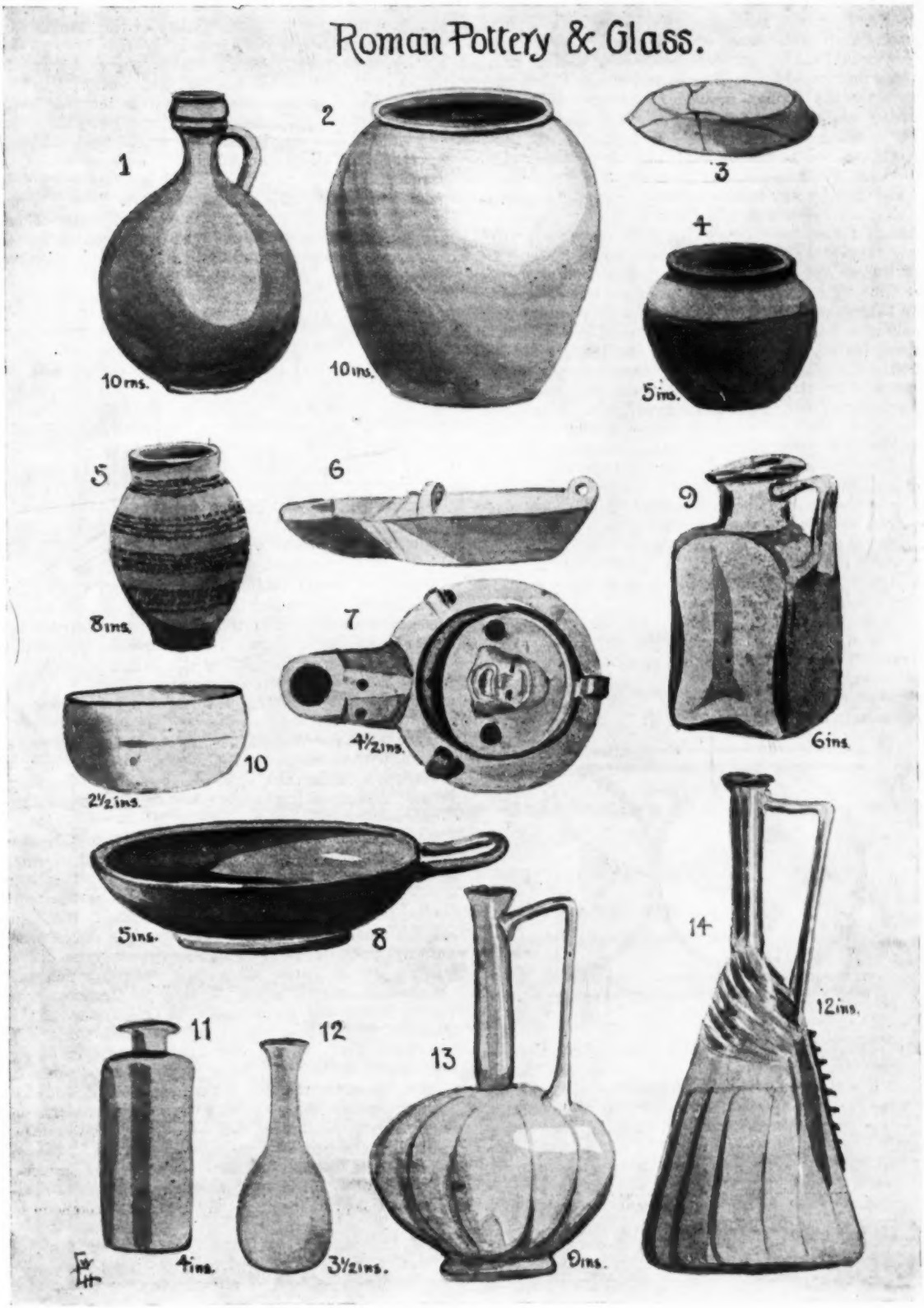

Roman Pottery & Glass.
1
10 ins.
2
10 ins.
3
4
5 ins.
5
8 ins.
6
7
4½ ins.
9
6 ins.
10
2½ ins.
5 ins.
8
11
4 ins.
12
3½ ins.
13
9 ins.
14
12 ins.

PLATE II.

stood; but suppose a number of boys are taken to an old Roman ruin as is shown in Fig. A, which is a photograph taken on a school excursion to Lympne (Kent). They would take a practical interest in making such a rough memorandum as Fig. B, and would realise more perfectly the Roman methods were they to make a similar rough note of a modern prison or dockyard wall. The bonding tiles, we believe, were often made in the neighbourhood of the building, and are generally about 16 inches by 12 inches, and from 2 to 3 inches thick.

It is not by any means unlikely that pupils from an up-to-date school would be taken to see any remains of Roman houses or villas within easy reach; in which case they probably would be most impressed with the pavements and hypocausts. There would not, of course, be time to make any detailed studies, but what notes are taken should be systematic and reliable, and should include a rough plan, with the dimensions at least in paces, for comparison with a rough sketch plan of a modern dwelling-house of similar class. In the highest classes of primary schools and in secondary schools the rough sketch plan might be compared with some typical plan from Pompeii to show how the Romans could modify their ideas to suit different climates. If tesselated pavements are visible, rough sketches of their design could be made, and their colour noted in little dabs on the sketch book in water-colour, reference being made as to which parts the colours indicate.

Even if these sketches are never afterwards referred to, which is most unlikely, the mere fact of having made them will give a wonderful power of memory that no other method can.

The first two figures of Plate I. are studies of a fragment of a pavement found at Lympne, and now in a Kentish museum. For a study of detail such a piece is quite sufficient for an industrious pupil, and a splendid exercise would be an attempt to complete the pattern, even as a geometrical drawing (Fig. C), much more valuable probably than many of the meaningless efforts at designs from plants we have been accustomed to see. Fig. 3 is a sketch of another fragment, which probably occupied an angle. An inscribed stone discovered at Silchester (now, it is believed, in Reading Museum) is sketched as Fig. 4. It would be difficult to find better formed letters than these, and study directly made from such a relic is certainly preferable to the copying of alphabets from books and diagrams so prevalent a few years since. If permission could be obtained, it would certainly be advantageous to take a rubbing of such an object as this, on thin tough paper with heel-ball; at any rate, the approximate measurements should be entered on the sketch.

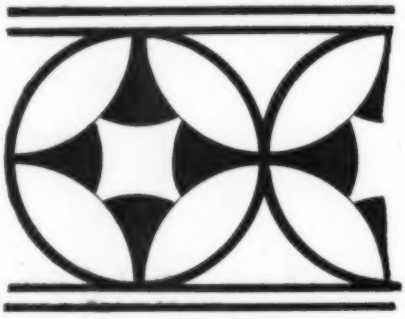


Fig. C.

A Roman sundial now in Dover Museum is shown as Fig. 5 in the same plate. Many of the Roman sundials were hollowed stones, and the shadow was cast by thin iron spikes. One, it seems, projected from the centre of the top of the heart-shaped recess. The hollows at the right-hand face showed the morning hours by the shadows projected from their edges. There are two similar ones on the opposite face. Such a simple form as this affords an admirable exercise upon the drawing of rectangular solids, and it is superfluous to point this out to experienced teachers. The drawing given was tinted with three washes of water-colour, made up of yellow ochre, raw umber, and cobalt, but an outline study slightly shaded would be just as effective.

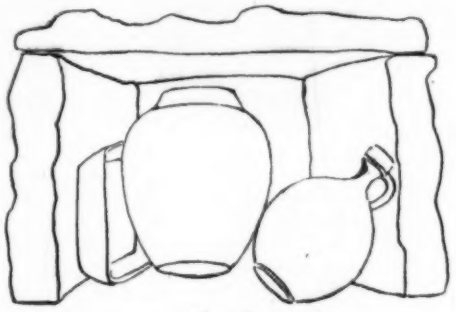


Fig. D.

Careful dating and naming is a very important point in such work done away from a school, and the reader must excuse this repetition of this point, for even experienced draughtsmen often regret the absence of a date or little note which they intended to add when at home. It should not be forgotten that without these little particulars a sketch is often quite meaningless to any one else.

Thanks to the custom of burying various domestic utensils with the ashes of the dead, many of our museums are quite rich in such examples of Roman industry. Often the charred fragments were put into such a glass bottle as that shown in Fig. 9, Plate II., a very common Roman bottle, such as would be found in most houses. At other times earthen vessels similar to Fig. 2, of which Fig. 3 is the cover, were used. This urn, together with the earthen bottle (Fig. 1) and an earthenware tray, formed the contents of a sepulchral chamber. (See pen-and-ink sketch, D.) Fig. 4 is an example of the well-known Upchurch ware. This can generally be distinguished by its smoky blue-black colour, which was obtained, it is believed, by stifling the furnaces with vegetable matter. Some idea of the importance of this ware will be obtained when it is remembered that it is discovered practically all over England and even on the Continent, and that the pottery extended for seven or eight miles on the marshes at the mouth of the Medway.

Another class of jar showing the characteristic string marks in rings is illustrated in Fig. 5. All these objects form good exercises in drawing, and perhaps in colouring, which is often as subtle as the form. If any such forms are drawn side by side with some machine-made similar article, the beautiful play of curve would soon be apparent.

A Roman lamp (Figs. 6 and 7) is sketched in a geometrical manner. This perhaps gives the best idea of such an article, which is always of great interest to children. This one had three chains, and must have

been suspended from a stand. When such a one was carried, it was, we believe, placed upon a dish similar to Fig. 8 to prevent the oil being spilt. Others had handles opposite to the (shall we say) light spout, to enable them to be carried. Surely the Romans made more use of daylight than we do.

The remainder of the articles shown are all of glass, and very elegant they are. Roman glass is not very transparent, but rather cloudy or dusty looking. Nevertheless its colour is often beautiful—deep blues, pale greens, and pale and deep ambers and yellows being prevalent, making it possible for a young student to get a passable drawing without being tortured with a multitude of glistening lights.

The little glass bowl (Fig. 10) was probably for drinking from; Fig. 11 might have contained unguents, and Fig. 12 is sometimes said to have held the tears of the mourners. It is not likely, however, that bottles were specially made for such purposes.

Very beautiful is Fig. 13. Its slight irregularity and general elegance make us see the beauty of hand-made glass. Notice the sudden thinning of the neck where it joins the body, the slight rise of the top of the handle, and its strong, treelike spring from the body, whose bulging curves are so subtly flattened near the top.

It would take a skilled glassworker to appreciate the refinements of Fig. 14, the delicate twist of the flutings at the top of the body, the pretty taper of the neck, the peculiar yet beautiful angle of the handle, and that little bit of playful chopping up of a piece of glass that might have been left over below the handle.

What better models could a teacher desire or have than such as these? If a museum containing such things be within reach, a few lessons in such drawing could not fail to bring good drawing power, together with refinement of taste and life, and meaning to history.

[The writer has been requested by the curators of Canterbury and Folkestone Museums to acknowledge the privilege of sketching the objects in Plate II., which are all to be found in these museums.]

If it be desired to measure the height of an object in a case, this can be very nearly managed by the following method. Look across the top of the object, getting the eye level with it, and place the end of a rule in line (Sketch E). Then, keeping the rule vertical, run the eye down until the level of the bottom of the object is reached. The reading on the rule will be the height of the object.

Almost all Roman objects found in museums are

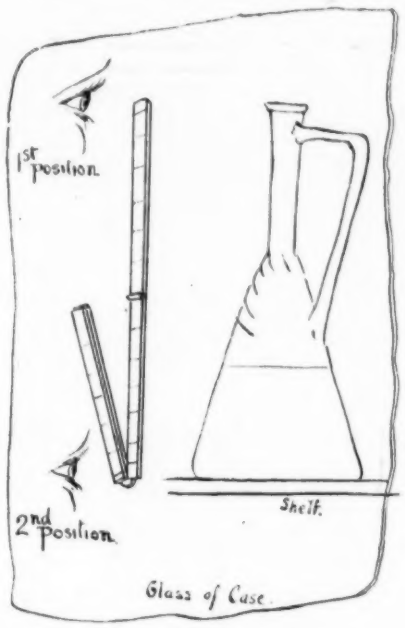


Fig. E.

suitable for children's study in some medium or other—inscribed stones, altars, amphoræ, personal ornaments, locks and keys, writing tablets, steelyards, knives, scissors, spurs, etc.—for most of them are splendidly designed, and are more or less typical of our present forms of them. Many also are quite simple in design, and not beyond the powers of even young children.

DRAWING IN PUBLIC ELEMENTARY SCHOOLS.

I.—GROVE ACADEMY, BROUGHTY-FERRY.

BY W. RYLE SMITH.

Senior Division.

THE drawing in the senior classes is very largely a continuation and amplification of the work done in the junior classes. The children have by this time attained a certain freedom in the use of pencil and brush, their observations have become more accurate, their perceptions of form and colour keener, and in general they have gained considerably in the spirit of the work. It is the aim of the teacher to keep alive these faculties, and to encourage and train the children in every way to look for beauty in their surroundings. With their advancing intelligence they can take a deeper interest in the wonders of Nature, which presents itself to them in so many aspects and under such different conditions relative to seasons, etc. The trees, flowers, leaves, shells, etc., afford endless material coming within the scope of their ability at this stage, although the selection has to be carefully made by the teacher, so that this part of the work may be carried on with profit. The attempt to reproduce with carefulness stamps the form and colour on the mind of the children as nothing else can, and so makes the knowledge really their own.

Collections of wild flowers are made by the children and exhibited in the classrooms. These are classified and a record kept, so that at the end of the season most of the children are familiar in a general way with the flora of the district. There are always a few keener pupils in this direction who stimulate the others. Bulbs are grown in school, and drawn at the various stages of growth (No. 1, Plate I.).

Tree twigs get a special share of attention in the senior division. The absence of the leaves leads the pupil to look for something else of interest to draw, and naturally the buds and their scales, scars of old leaves, junctions

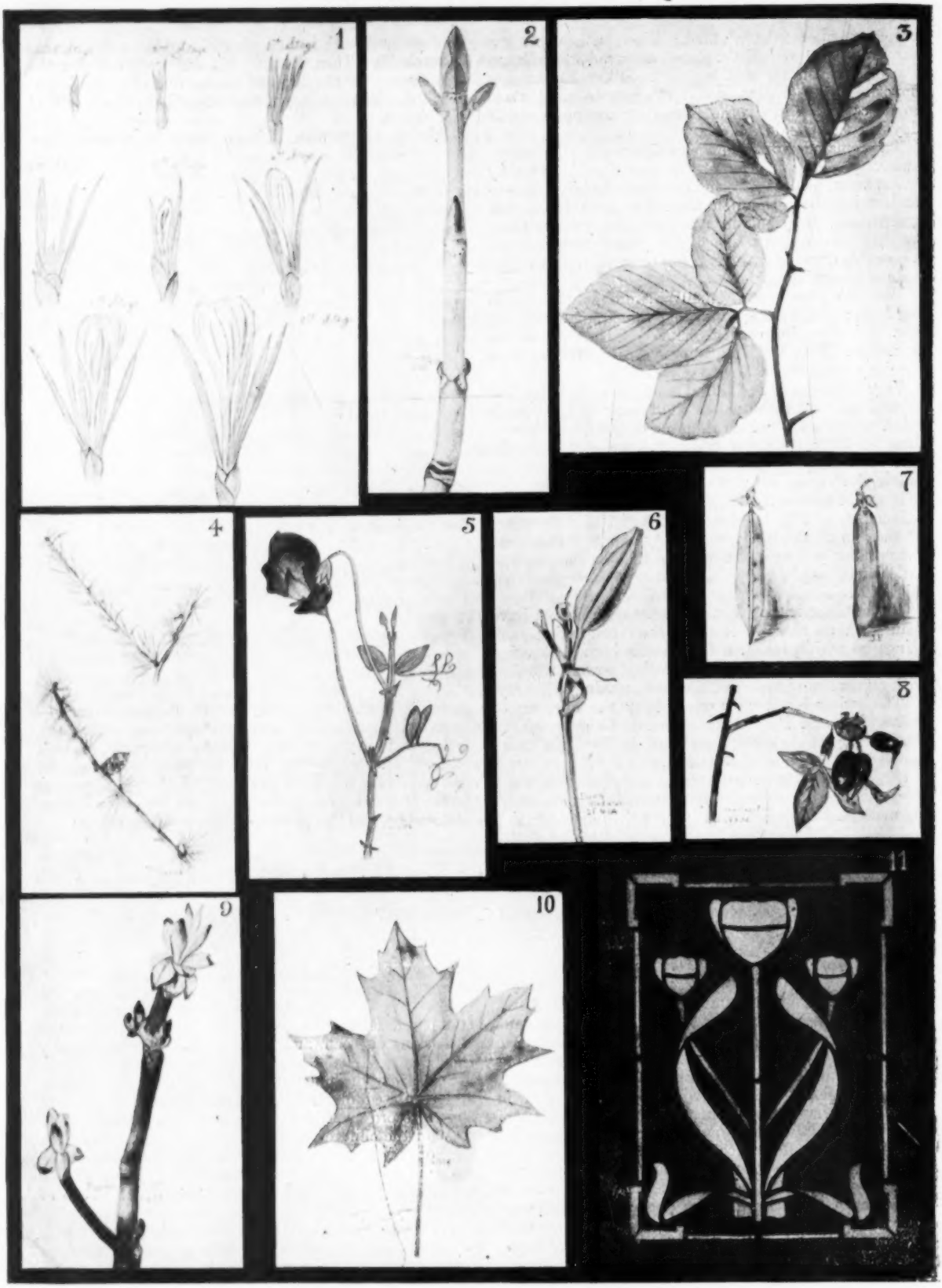


PLATE I.

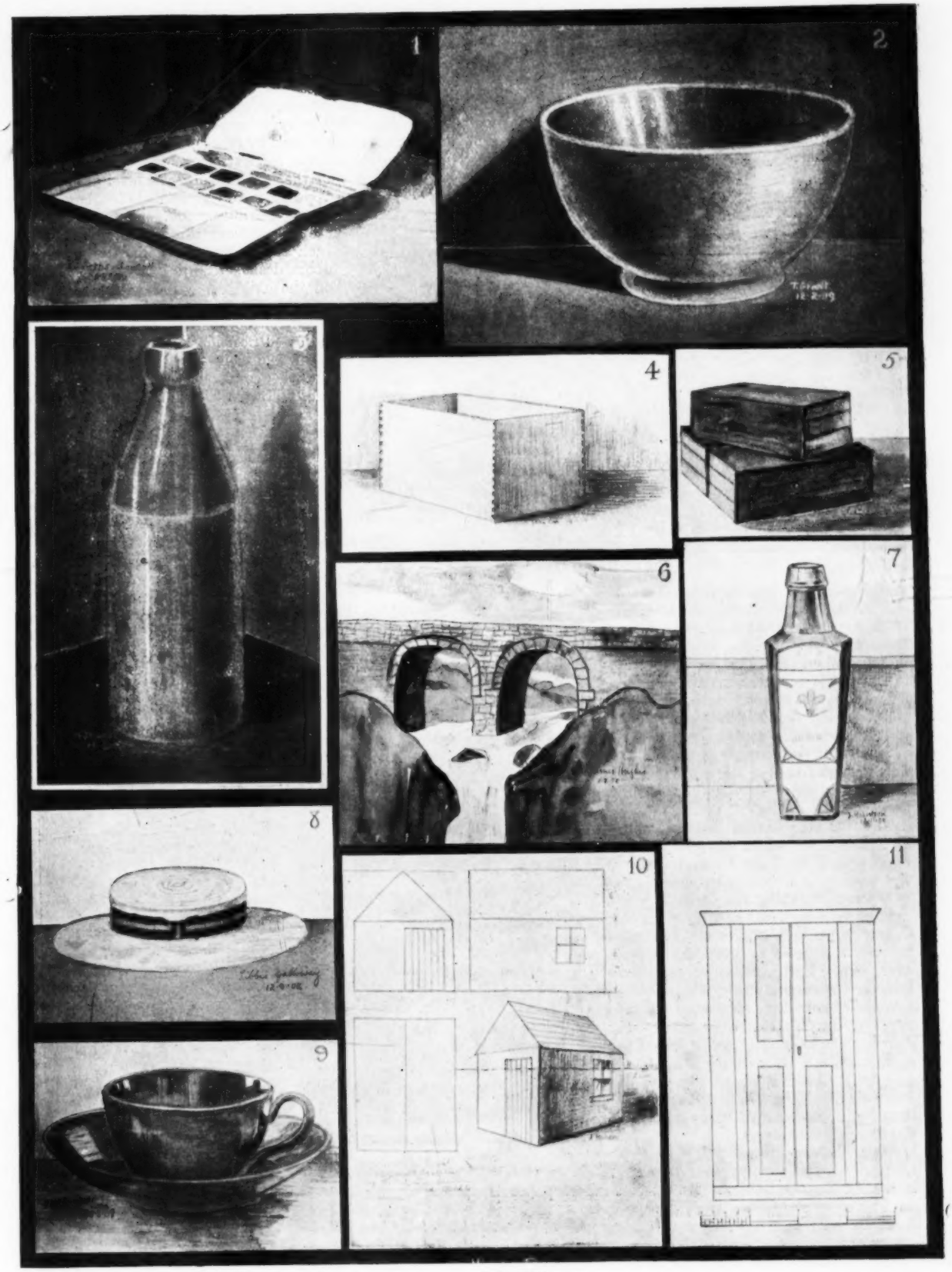


PLATE II.

and their markings get their due attention. The pupil thus unconsciously acquires knowledge of the things that count in the structure of the *bare* twig.

The horse-chestnut (No. 2, Plate I.) presents very good examples to begin with; it is on such an ample scale that no difficulty is experienced in making out the markings. The poplar, elder, ash, and lime are also within the scope of the children. The twigs at this stage are quite good colour studies, although they are frequently executed in pencil. Later on the bursting bud is drawn (No. 9, Plate I.) and new details brought forward, the teacher encouraging the children to take an intelligent interest in the development of the twig and to carry out faithfully all the details of growth. Still later, when the twigs in full leaf are given, the children find much interest in the drawing of the main stems and their junctions, veining and serrations of leaves, etc.

PLATE III.

The autumn-tinted leaves supply abundant material in the senior classes (Nos. 3 and 10, Plate I.), and many of the seed-vessels are also drawn, the latter usually taking the form of pencil drawings (Nos. 4, 6, and 7, Plate I.). Colour and pencil studies are alternated in such a way as to keep the interest ever fresh. Too much stress cannot be laid on the careful supervision required here, as the children so readily fall into slipshod ways, and a nature-study drawing has little or no value unless the details are faithfully carried out.

A beginning is made at this stage in stencilling. Very simple designs are drawn out, and the children are taught the use of the stencil knife (vaccino-style) and stencil brush. The neatness necessary to successful work of this kind is a valuable attainment. No special stencil-paper is used; the ordinary drawing-paper is good enough: it is easily cut, and with care is quite durable for all practical purposes.

In the junior classes the objects for drawing were based on cylindrical and conical forms, but now straight-lined objects are attempted, the drawing of which involves further ideas of perspective; and the teacher has first to elicit from the children's observations what they already know by reference to *converging lines* (as in looking along a railway track), the *apparent decrease in size of objects* (as in a street scene), and the lines of the houses below the level of the eye appearing to *rise* and those above the eye appearing to *fall*. Many examples are taken from things in the rooms—such as the horizontal lines of presses, doors, desks, etc.—to impress these ideas on the children, and they are required to show how certain lines should be drawn to represent objects as seen from indicated positions.

The horizon line is then explained, and the convergence of all horizontal lines towards this line. Simple objects of a square or rectangular shape—such as boxes and books—are then represented in many positions, showing lines receding directly and others at various other angles. Doors, walls, and windows are drawn so as to give lines *above* as well as *below* the eye. When the children are thoroughly familiar with these, an exercise such as is shown in No. 10, Plate II., is given, and usually proves interesting to them. The height of the person supposed to be viewing the hut from the direction of the arrow-head was stated to be 6 feet. The height to the eaves of the hut, it will be noticed, is 8 feet. Views of buildings as seen from the school windows are also attempted at this time, and Plate III. is the joint-work of two Standard V. girls. They first made a sketch in pencil, and then combined their sketches in the blackboard drawing shown, which filled a space 3′ 6″ × 7′.

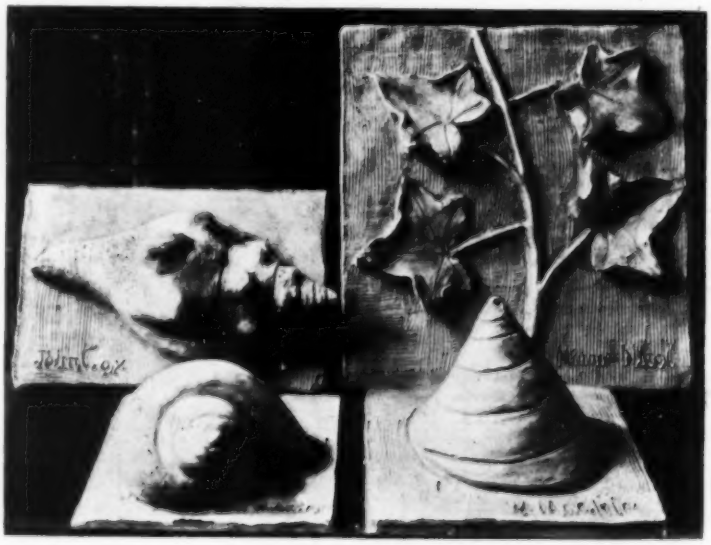


PLATE IV.

Nos. 1 and 5, Plate II., are in full colour; No. 8 is a pencil drawing tinted.

Light and shade of objects in pencil gets a good deal

of attention in the senior classes, and "tone" drawings are attempted. Nos. 4, 7, and 9 are all in pencil. The last mentioned is a dark-blue cup (Doulton). A BB pencil for this kind of exercise is an absolute necessity.

Two colour studies in crayons are shown in Nos. 2 and 3, the extreme depth of the shading and shadows being obtained without colour from the tint of the brown paper on which the drawings are made.

Memory and imaginative drawing are continued on the lines indicated in the junior school. No. 8, Plate II., shows a drawing by a Standard V. boy. The exercise set was any old bridge that had been visited.

Scale drawing at this stage is confined chiefly to the furniture in the classrooms; but before drawing the various items—such as blackboards, cupboards, tables, and desks—a thorough drilling is given in the construction and use of scales. The scales given are from 6″ to the foot ranging to ¾″ to the foot. Reference is made to the drawings made by architects and engineers in preparation for the building of houses and the construction of machines, and, when available, such drawings are exhibited to the class. Attention is also drawn to the fact that in certain crafts—such as watchmaking—the drawings are often made to a *larger* scale than the finished article. The compasses used are the ordinary school variety, with pencil-holder large enough for the usual drawing pencil; 45° and 60° set-squares and 12″ rulers are given to each pupil. To begin with, the teacher draws the object on the blackboard, the children following with their drawing on paper. All the measurements, however, are made by the children, who come out to the object in turn. Finally, they are left to themselves to make dimensioned sketches of the things, to be drawn afterwards to scale. The drawings are made in a clear pencil outline and coloured (No. 11, Plate II.).

The modelling by the seniors is done in ordinary clay, as it is found to be more convenient than plasticine for the building up of the large objects attempted; and as it would be impossible to give every child accommodation and material for this work in classes ranging from fifty to sixty-five, it is restricted to groups of ten or twelve, who are selected and given modelling—which they all like—as a reward for excellence in the other sections of the work. The examples shown on Plate IV. are all done by Standard IV. pupils.

CARDBOARD MODELLING.

BY FELIX T. KINGSTON, BARRY.

Model No. 3.—A Square Mat.

TO be bound and covered. The drawing, cutting, and binding have been simplified on account of the new difficulty involved in the use of covering paper.

The drawing required is simply a three-and-a-half inch square (Fig. 6*a*). Bind two opposite edges as at AB, cutting off waste ends after fixing; each corner then appears as at C. Bind the other two edges, mitring the ends before fixing, when each corner appears as at D.

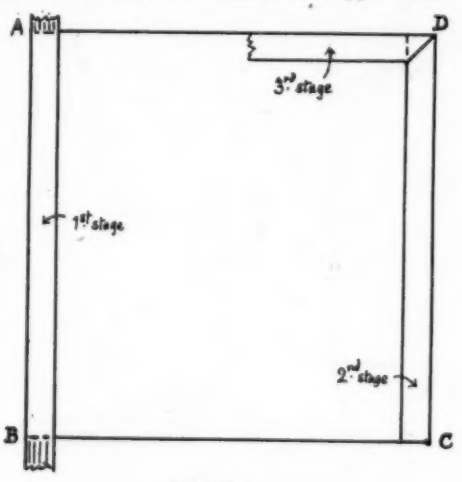


Fig. 6*a*.

Select a piece of covering paper which tones with the binding, and draw on it a square the side of which is a quarter of an inch less than the side of the mat, so that when finished a margin of binding an eighth of an inch wide will show all round. The square may be cut out either with scissors or knife. Before moistening, superimpose it on the card and carefully note the position in which it fits best. In the photograph (Fig. 2, April issue) one corner of the covering paper is raised so as to show construction. Fig. 6*b* also illustrates the finished model: *abcd* is the covering paper; the dotted lines represent the hidden edges of the binding.

It is when one arrives at the stage of cutting covering papers to size that errors in previous work are shown up most. One frequent source of error lies in not placing the crease of the binding close up to the edge of the card, the result being either to enlarge the model

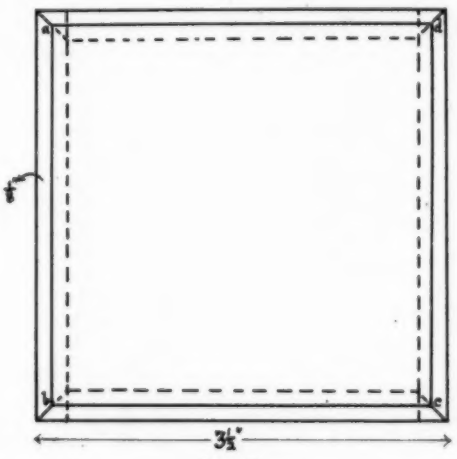


Fig. 6*b*.

or else to produce a crooked edge, which distorts the shape. In such a case nothing remains but to discard the model and begin afresh, as it is impossible to tear off the old binding and replace it by new.

To prevent accumulation of faults the teacher had better examine every model stage by stage as it proceeds—first the drawing, then the cutting out, next the binding, and so on. Such procedure, too, will

afford the teacher an opportunity of giving directions piecemeal as to methods of construction.

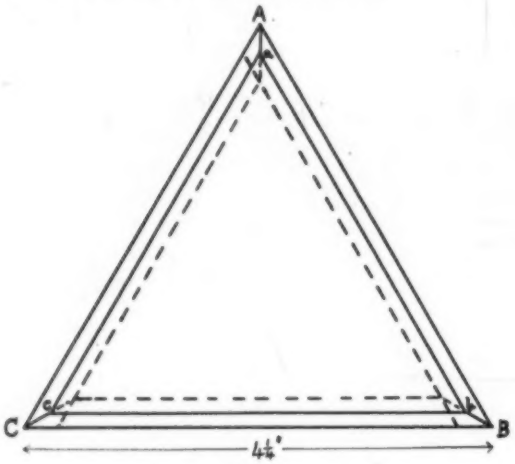


FIG. 7.

MODEL NO. 4.—A TRIANGULAR MAT.

This practically repeats the exercise immediately preceding. In the present instance it is suggested that no help be given to the pupil; merely tell him to make an equilateral triangular mat, bound and covered, a sketch being previously submitted for approval. These two models were shown in the photograph in the April number.

Fig. 7 represents a finished model: *abc* is the covering paper. The edges were bound in the following order: AB, AC, BC.

MODEL NO. 5.—A PHOTO FRAME.

This model is purposely made very primitive in character. The drawing is shown in Fig. 9*a*, the dimensions being expressed in the metric system.

The cutting and binding of a hole are here introduced. When cutting out the corners, proceed *outwards* from, say, A to B, and then from A to D, forcing the point of the knife each time well into the corner at A.

As to the binding of the edges of the hole, note that the pieces will not overlap each other at the corners, but will lie edge to edge, as in the case of the re-entrant angles of the star (Model No. 2). Proceed as in the former case by placing a piece of folded binding along, say, BC (Fig. 9*a*), marking along the lines BY, CX, for mitring, and cutting off the waste (shaded) before fixing. The outer edges may be bound in any order, provided the ends which overlie others are mitred.

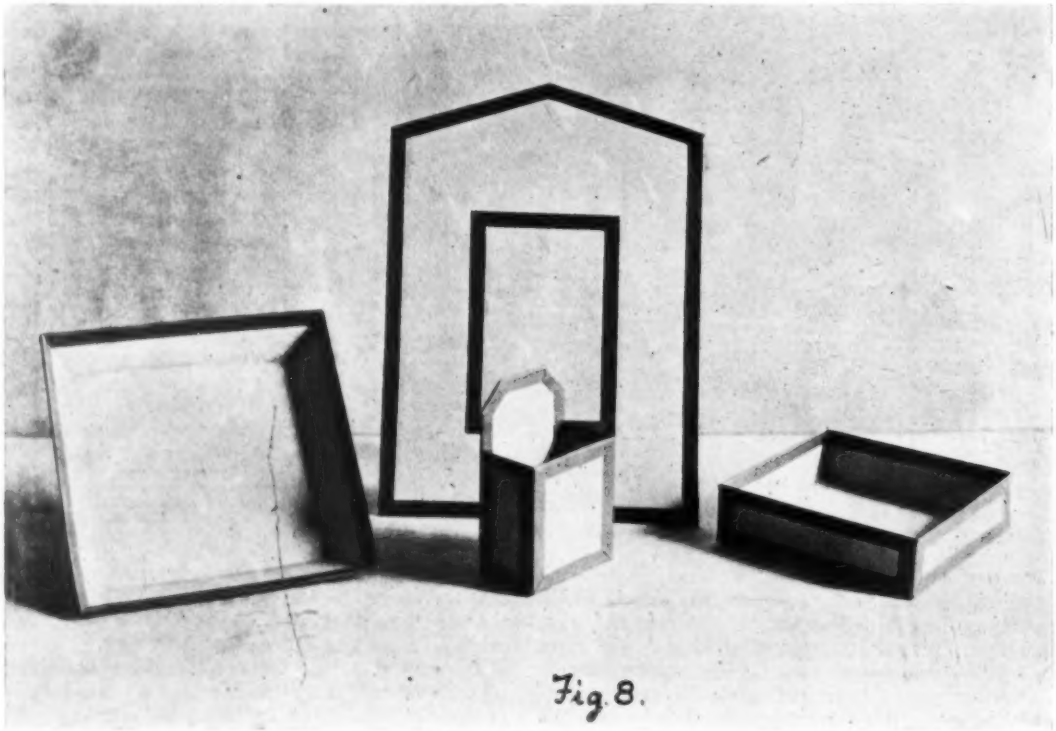
The design of this model is meant to be merely suggestive. The outer edge may assume other forms, as in Fig. 9*b*. Much greater interest will be secured if different pupils work different designs, especially where they are encouraged to vary non-essential details of this kind as they please.

The frame may be made of suitable dimensions to fit any particular photograph, picture, newspaper illustration, etc., these articles being attached to the back by gluing their edges.

MODEL NO. 6.—A BOX OR TRAY.

For the development, see Fig. 10*a*.

From this stage of his career onwards the pupil will in most cases be able to construct his own drawing from examination of a completed model. To supply him in every instance with a fully-planned and dimen-



MODELS 5, 6, 7, AND 8.

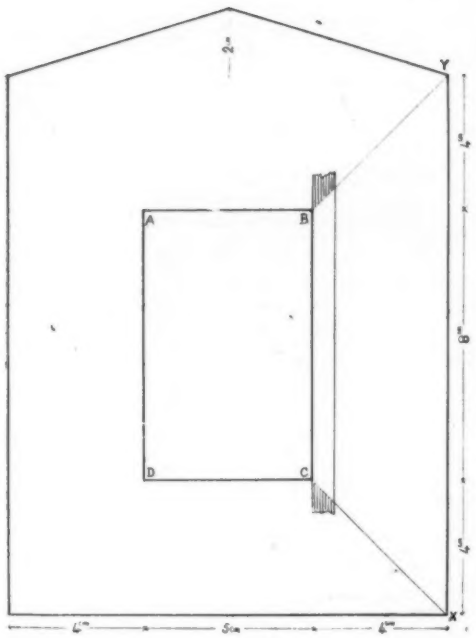


FIG. 9a.

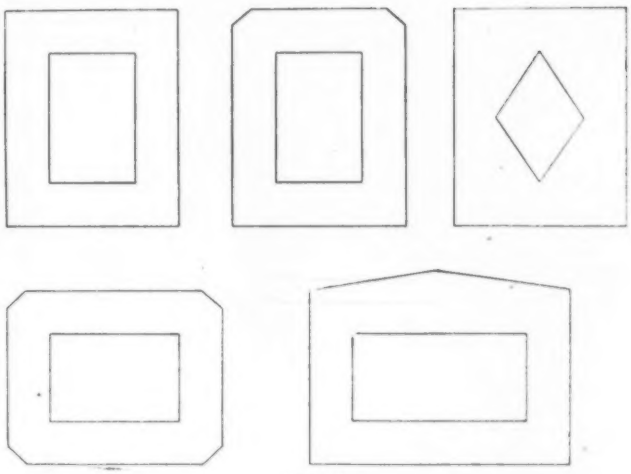


FIG. 9b.

sioned drawing is to deprive him of the opportunity of thinking out problems for himself, to provide him with crutches when he is able to walk unaided. The child reaps most benefit by making little discoveries on his own account, and not by working only under the direction of the mind of some one else. Further, by planning his own drawing, the child will more intelligently perceive the correspondence between the drawing and the finished product.

It will be best to construct the drawing by first making the square ABCD $3\frac{3}{8}$" (Fig. 10*a*), and producing the sides.

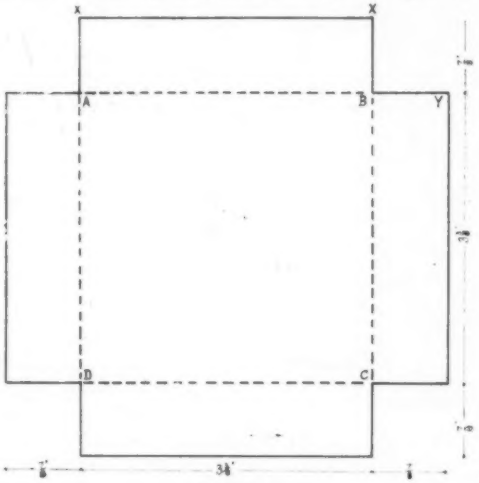


FIG. 10a.

The operation of "scoring" cardboard—that is, cutting partly through it to allow of its being bent over evenly—is met with here for the first time. The lines to be "scored" are indicated by being dotted. Most particular attention must be paid to exactness of scoring. The incision should be clean, perpendicular, and of uniform depth, reaching a little more than halfway through, so that the card will freely bend without breaking. Some preliminary practice should, of course, be given before attempting this model.

Scoring is of great service in developing self-reliance. It is a delicate operation, and demands concentration of effort. The pupil gradually becomes able to put forth all his powers, and to stake the result on one bold but conscious movement of the hand; and success will come to him not by chance, but by such well-directed co-operation of hand and mind. He is stimulated by trust in his own capabilities, by the consciousness of possessing power to do, and by the reward of true effort. Scoring is thus a vital part of the work. It is necessary to remark that on no account should faults of scoring be excused, although the incised edges may be subsequently hidden by binding or covering. Such extenuation of errors blurs the child's vision of truth.

It is possible with due practice to perform scoring with machine-like precision; which leads one to remark that the use of expensive mechanical devices for scoring is, on educational grounds, unjustifiable, for they deprive the hand of the opportunity of one of its most valuable exercises.

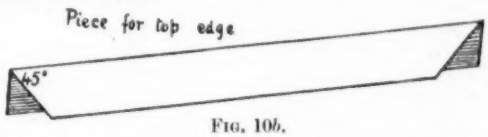


FIG. 10b.

After scoring and cutting out, bend up the sides of the box (keeping the drawing *outside*), and see that BX = BY, etc.

Flaps will not be used in this stage, except for closed models, because of the disfigurement caused by the thick cardboard. Fix the edges by means of the strips with which the box is bound. Paper strips are not strong enough; cloth must be used here. Proceed thus: Cut off a piece $\frac{7}{8}$" long, fold it, and fasten together the edges BX, BY, holding them in position until well set. While this corner is drying, fasten the opposite one at D. Now fix the other two corners. Next bind the top and bottom edges. Fig. 10*b* shows how a piece of binding must be mitred for fixing along the top edge, the mitred corners being placed outside.

(To be continued.)

HONOURS PAGE.

THE list this month is as follows :—

1. Gertrude Perry (10), Fairfield Junior School, Bristol.
2. William Easton (10), Tillmouth Council School.
3. H. Martin (13), Mantle Road Council School, Leicester.
4. Beatrice White (13), Boothferry Road Girls' School, Yorks.
5. Halcot Whitehead (14), Sulyard Street Council School, Lancaster.

With the exception of No. 3, all the drawings were in colour. No. 3 was a good strong pencil drawing. We would gladly welcome more work of this character, especially during the summer months of the year. Town and country alike abound in good material of this kind; such studies carry the work beyond the four walls of the school, and throw the scholars on their own resources.

It is surprising how many competitors send in work of an unsuitable character. We have said repeatedly that faint pencil work either in line or tone is really of no use, simply because it defies any satisfactory reproduction by photographic process. Sketches scattered indiscriminately over a sheet, leaving awkward spaces, have also to be put aside. Packages still come *rolled*, notwithstanding the constant reminder that all drawings should be *packed flat*. They may be sent at any time, addressed to Mr. J. Vaughan, 7 Campside Crescent, Langside, Glasgow.

Isaac Wright, Hurley Council School, was awarded a prize last month. It was sent to the address, and was returned marked "not known." Will Isaac please send his full address?

NOTES AND SUGGESTIONS ON THE TEACHING OF EXPERIMENTAL SCIENCE, MATHEMATICS, AND DRAWING.

BY C. HAMILTON.

(*Continued from page 590.*)

IV.—The Scheme in Detail.

THIS article contains the first four sections, and deals in the main with linear measurement. Incidentally fractions, decimals, percentages are revised, and problems on velocity are introduced.

Section I.

The object of this section is to revise the methods of manipulating fractional quantities. It is not necessary, however, to deal with fractions directly, and the students may be asked to measure up a few lines, and to add and subtract them. If this is beyond them, they may be asked to examine the rule. After stating the length, they proceed to notice the divisions. It will be observed that in the case of the inch the longest dividing line marks it off into two *equal* parts. The method of writing down half numerically having been given, the students proceed to examine the division into quarters, eighths, and sixteenths. The class is then asked how many quarters in a half? How many eighths in a quarter? a half? and a whole? and so on. The terms quarter and fourth should both be used. The former is a practical everyday word, and the latter helps to connect the method of division adopted with the division of the whole into three, five, or more parts by a common terminology.

If it is thought that the idea of a fraction developed in this way is limited too much to length and the use of a scale, a rectangular or circular piece of paper may be folded and cut into two or four equal portions, and dealt with in the same way.

Lines may now be drawn on the exercise book, or, better, supplied to the class on tracing paper and pricked off into the book. These lines should be measured with an accuracy of at least $\frac{1}{32}$ inch. The lengths should be added together, whole numbers being summed mentally, and the fractions added on the rule.

Shorter lines of given length may next be drawn, and subtracted from the longer ones in the same way as addition was performed. In cases where the shorter line has a fractional part greater than that of the longer line, the subtraction may be done in the first case by actual measurement of the difference. A series of +ve and −ve lengths to be summed will give the notion of sign as indicating direction.

Side by side with the above measurements the class should perform the operations numerically, noticing particularly the necessity for and the method of reducing the fractions to a common denominator.

From this point the students may be asked to find multiples and sub-multiples of the lines they have measured, the process being explained graphically in such a way as to bring out the fact that multiplication and division are only forms of addition and subtraction. If the latter were done more frequently, questions like the following—How many times can 33 be taken from 990?—would be less of a stumbling block than they are.

Before proceeding to the examples, the following points should be noted:—

1. The student obtains an idea of a fraction and some practice in measurement before he is taught the process of adding and subtracting.

2. In cutting up the piece of paper the method of measuring the area is not considered, and the test of equality is superposition.

3. Fractions of which the denominator is not either 2 or a multiple of 2 are explained by analogy.

4. Nearly the whole of the work is done by the student in his own book, and not by the teacher on the blackboard. The proportion, however, will vary with the age of the class; the younger the students the more need have they of making the drawings themselves. Older students have an experience and a mind-content which renders much of the individual work unnecessary.

To return to the examples. These must be concrete and short. If they are complicated, the steps should be clearly shown in the wording of the question. The earlier ones especially must be short. When a student has worked an exercise correctly he feels more or less satisfied with himself, and has gained confidence. A long exercise is tiring, and if the student gets it wrong he loses confidence. Three short examples can be worked in the same time as one long one. They give three times the amount of practice in the process, and the student enjoys the stimulus of three successes where he would in the other case enjoy only one.

The kind of example to be worked will depend upon the type of school in which the instruction is given. With schoolboys the whole range of human activities, so long as they fall within the sphere of his comprehension, may be drawn upon for the purpose. But in the case of boys who have left school, the selection should be mainly those which bear upon their everyday occupation. Such exercises fall under the heads, in text-books of arithmetic, of partnership, proportional division, rates and taxes.

The disadvantage, however, of miscellaneous examples is that the student is called upon to skip mentally from one topic to another, after the manner of a scatter-brain. This sort of mental gymnastics is all very well if he is well grounded in the process, but it is unsuitable to the novice.

The practice, moreover, of prefacing "problems" by a series of numerical examples such as $\frac{1}{3}$ of $\frac{7}{8} - \frac{5}{6} + 2\frac{1}{2} - 7\frac{1}{4} \times 3\frac{3}{5}$, etc., leads to mere mechanical drudgery. It is a great advantage if the earlier examples can centre round some concrete topic, so that the student comes to regard the fraction as being a part of something, and the method of manipulation as subservient to some practical end.

The students may therefore proceed to measure up and make a dimensioned sketch on squared paper of the floor of the room, marking the position and dimensions of the desks, cupboards, etc. The drawing should not be too small, and it would be better to use a sheet of drawing-paper not less than, say, $16'' \times 12''$, than to cram it into a small drawing-book.

For these measurements an ordinary ruler or two-foot rule should be employed. The exercise is one on measurement and fractions; a "scale" drawing is to the class a "fractional" drawing, and a scale must therefore neither be made nor supplied.

The walls of the room should next be measured and sketches made. The assistance of the teacher, and probably of a ladder, will be required for the height.

A careful drawing of the walls and floor should be the next task. The idea of "rotating" the walls about the ground-line so that they will appear to lie out flat in the same plane as the floor, can be explained by a paper model. Another method is to procure a cardboard box of similar shape to the room; the lid should be removed, and the box cut with a knife down the vertical edges, permitting the sides and ends to be laid out flat. This illustration should not be used until the best way of representing the walls in relation to the floor has been discussed.

Some or all of the drawing of the walls may be reserved for Section II., in which case the measurements will be in decimals. If a drawing of the room has been done previously, something else may be chosen. So long as it has some human interest, and is not one of the unprintable regulation models, with its chilling geometrical outline, anything will serve the purpose.

EXERCISES.

1. Express the measurements on your drawing as—(*a*) Yards and fractions of yards; (*b*) feet and fractions of feet.

2. Find what the dimensions of the drawing would have been if it had been $\frac{1}{12}$, $\frac{1}{24}$, $\frac{1}{48}$, $\frac{1}{144}$, $\frac{1}{288}$ of full size.

3. What length on your drawing would represent one foot in each of the above cases?

4. You are provided with an Ordnance Survey map of your district. What is the distance between the towns A and B, C and D, E and F? One inch on the map represents one mile.

5. What is the ratio of any distance on the map to the real distance in the above example?

6. A map showing the railway between Liverpool and Manchester has to be drawn on a sheet of paper 36″ × 24″. The towns are 31 miles apart. What will be the most convenient scale to adopt?

7. A plan of a house has to be drawn on a sheet of paper 22″ × 16″. The frontage is 36′ and depth 35′. What scale will you adopt?

8. A bricklayer receives 7½d. per hour, and works 9½ hours on Monday, 9½ on Tuesday, 5 on Wednesday, 9½ on Thursday, 9½ on Friday, and 4½ on Saturday. What will he receive in wages?

9. A joiner receives 7d. an hour, and works 51½ hours in a week. What are his wages?

10. A man engaged in piecework draws in day wages for a month £6, 17s. 6d. During the same period he has earned £9, 8s. 6d. What "balance" will he draw, and what fraction will this be of his day wages? In some works the piecework price is "docked" if the workman earns more than "time and three-eighths." Is the foregoing example on the safe side?

11. Find the cost of (*a*) 12 cwt. of coke at 15s. 6d. per ton, and (*b*) 1 ton 3 cwt. of coal at 23s. 6d. per ton.

12. A house is assessed at £45 per annum, and the rates are 7s. 2d. in the £. What is the amount of the rate per annum?

13. The proposed income-tax on earned incomes of less than £400 a year is 9d. in the £, with a rebate of £160, and a further rebate of £10 for each child under sixteen years of age. A man has an income of £250 a year, and 4 children under sixteen. What income-tax will he pay?

14. A man has been living in a house rented at £55 and assessed at £46 in a town in which the rates were 4s. 6d. He moves into a house rented at £50 and assessed at £35 in a town in which the rates are 7s. 6d. Which is the cheaper house, and by how much?

15. A common quotation for boring colliery shafts is 7s. 6d. a fathom for the first five fathoms, 15s. a fathom for the second five fathoms, 22s. 6d. a fathom for the third five fathoms, and so on, increasing 7s. 6d. per fathom for every five fathoms increase in depth. Draw a graph showing the relation between the price and the depth, and find the cost of boring shafts of 160, 213, and 247 fathoms.

16. The Diamond Rock Boring Company's price for boring is 8s. per foot for the first 100 feet, 16s. per foot for the second 100 feet, 24s. per foot for the third 100 feet, and so on, increasing by 8s. a foot for each 100 feet.* Draw a graph showing the variation of price with depth, and find from it the cost of sinking shafts 70, 85, and 109 yards deep.

* Peel's *Coal Mining*. (Blackie.)

17. A colliery winding rope weighs 20 lbs. per yard. The shaft is 740 yards deep, and the cage weighs 5 tons. What is the weight on the rope at the pit head when the empty cage is (*a*) at the bottom of the shaft, (*b*) halfway up?

Section II.

The object of this section is to teach or to revise the decimal notation.

The class will, as in Section I., measure lines with a rule divided into tenths. The lengths of these lines will be added together, and shorter lines will be subtracted from them by measurement of the difference. These will be expressed as decimals, and the next step will be to direct the attention of the class to the corresponding values expressed as a fraction.

The decimal system of notation can be explained by analysis of a number, such as 9763. This will, of course, be expressed as 9 thousands + 7 hundreds + 6 tens + 3 units. The use of a dot or decimal point after the units figure may be followed by the division of 9763 by 10, by 100, and by 1,000, and the product of ·00341 and 10, 100, 1,000, etc. The conversion of vulgar fractions into decimals and *vice versâ* can then be explained.

At this stage questions on percentage, commission, profit and loss can be worked so far as may be considered necessary to the class.

EXERCISES.

1. Express the lengths on your drawing of the room as—(*a*) Yards and decimals of a yard; (*b*) feet and decimals of a foot.

2. A joiner requires 20 pieces of timber each 5′ long. Ten-foot lengths are unobtainable locally, and he is in doubt whether to order 12′ or 18′ lengths, both of which the timber merchant has in stock. What would he waste in each case? Express the result in each case as—(*a*) A fraction of the whole; (*b*) a decimal of the whole; (*c*) a percentage of the whole. If the price of the timber is 1½d. a foot, find the cost of the whole lot which it is necessary to purchase, and of the amount which is wasted so far as that particular job is concerned.

3. The following are the proportions of the metals present in certain solders:—Fine solder, 2 parts of tin to 1 part of lead; tinman's solder, 1 part of tin to 1 part of lead; plumber's solder, 1 part of tin to 2 parts of lead; coarse solder, 1 part of tin to 3 parts of lead; pewterer's solder, 2 parts of tin to 1 part of lead and 1 part of bismuth. Express the composition in each case as a fraction, a decimal, and a percentage. Calculate the amount of each constituent required to make ¼ cwt. of each kind of solder.

4. A manufacturer is told that if he adds a fuel economiser to his boilers he will save 25 per cent. of his fuel, and that if he uses a mechanical stoker he will save 20 per cent. He decides to adopt both contrivances. What percentage does he save? If formerly he burnt 20 tons of coal a week which cost him 14s. a ton, what sum does he save per annum?

5. The price of a bicycle is £10 with 5 per cent. discount for cash. One man buys his in this way, and another pays for it in twelve monthly instalments of £1. What is the difference in the cost of the two machines to the men who bought them? Express this as a percentage loss in the case of the man who adopted the instalment plan. Suppose the machine cost the dealer £7, 10s., what is his profit per cent. in the two cases? If the man who purchases his machine on the hire system saves thereby 1s. a week in train fares, how long will it take him to pay for the machine, allowing £1 per year for repairs?

The compositions of alloys given below will enable the teacher to devise any number of problems of the type of Q. 3.

Common brass, 66 per cent. copper, 33 per cent. zinc; brass for locomotive boiler tubes, 70 per cent. copper, 29·5 per cent. zinc; gun-metal, 87·5 per cent. copper, 12·5 per cent. tin; bell-metal, 78 per cent. copper, 22 per cent. tin; phosphor-bronze, 82 per cent. copper, 13 per cent. tin, 4 per cent. lead, 1 per cent. phosphorus (used for telegraph and telephone wires); manganese bronze (used for ships' propellers), 81 per cent. copper, 17 per cent. manganese, 1·5 per cent. iron; delta metal, 55 per cent. copper, 43 per cent. zinc, 1 per cent. iron; pewter, 20 per cent. lead, 80 per cent. tin; type metal, 70 per cent. lead, 18 per cent. antimony, 10 per cent. tin, 2 per cent. copper;

stereotype metal, 82 per cent. lead, 14·8 per cent. antimony, 3·2 per cent. tin; white metal, 60 per cent. lead, 20 per cent. tin, 20 per cent. antimony; Britannia-metal, 90 per cent. tin, 8 per cent. antimony, 1–2 per cent. copper; German silver, 60 per cent. copper, 20 per cent. zinc, 20 per cent. nickel; coinage silver, 92·5 per cent. silver, 7·5 per cent. copper; standard gold, 24 carat; 22 carat gold, 91·66 per cent. gold, 8·33 per cent. silver.

The composition may vary a good deal in most of the above cases.

Section III.

The aim of Section III. is further practice in measurement and in the manipulation of vulgar and decimal fractions.

Let the students measure straight and curved lines and various objects in inches and centimetres, and find how many centimetres in an inch and how many inches in a metre. This gives an idea of what is meant by a *ratio*, besides considerable practice in division of decimals.

Some of the measurements may be made on a curved surface with string. The source of error here is considerable, and the students should ascertain what relation this bears to the whole length, and express it as a fraction, a decimal, and a percentage.

The importance of making a series of measurements where accuracy is required will lead to the idea of an *average* value. Both error of measurement and average provide opportunities of solving interesting practical problems.

Further practical problems can now be worked on velocity. Begin, for example, by saying that if a train moves over 1,200 yards in one minute, and the same distance in each succeeding minute, it is said to be moving with uniform velocity. Ask how far the train would go in a second, and in an hour. Then ask how far it would go in 2, 5, 7, 15, etc., minutes. Hence get the class to state that distance passed over by train = velocity of train × time.

Explain that it is unnecessary to write this out in full, and that it may be expressed as

$$s = v \times t.$$

Set problems on velocity in which s, v, or t have to be found.

Explain how velocity may vary. Put down a series of velocities and times in tabular form, and plot on squared paper. Explain variable and average velocity by means of these diagrams, and show how to find intermediate values and values outside of these. In other words, interpolate and extrapolate, without of course using these words to the class. It is equally unnecessary to call the formulæ $s = vt$ an equation.

Exercises—Drawing and Numerical.

1. Measure several lines in inches and centimetres. Draw a graph and use it to find the dimensions of the room in centimetres. Convert these into metres and decimals of a metre.

2. A tram moves from rest. At the end of the 1st, 2nd, 3rd, 4th, and 5th seconds it has a velocity of 1, 2, 3, 4, 5 miles per hour respectively. For ten minutes the speed remains constant, and then the tram slows down at the same rate. Represent the changes in velocity by a curve. Find by measuring your drawing the average velocity and the distance covered in each of the first five seconds, and the total distance covered altogether.

3. What is the error if 2·5 cms. is taken as equal to 1″ instead of 2·54? What is the ratio of this error to 2·54 expressed as a vulgar fraction, a decimal, and a percentage?

4. (*a*) Read off the following numbers correct to the nearest thousand—85761, 794386, 1352719; (*b*) read off the decimals given below correct to the nearest thousandth—3·68275, 0·962843, 19·785623; (*c*) read off 5·3146 correct to 3 significant figures, 71·567 correct to 4 significant figures, 2153 correct to 2 significant figures.

5. Given that a train travels at the rate of 60 miles per hour, find the velocity in feet per second. Without working it out again, write down the following velocities in feet per second—30 miles per hour, 45 miles per hour, 15 miles per hour, 22½ miles per hour, 37½ miles her hour, 52½ miles per hour, 67½ miles per hour.

6. Convert 60 miles per hour into cms. per second.

7. A train leaves Edgehill, Liverpool, at 10.5, and arrives in Manchester at 10.40. The distance is 29½ miles. What is the average velocity?

8. A train leaves Manchester at 10.30, and arrives at Warrington, 13 miles away, at 10.45, stops for five minutes, and arrives at Liverpool, 31 miles away, at 11.15. Find the average velocity (*a*) between Manchester and Warrington; (*b*) between Warrington and Liverpool; (*c*) between Manchester and Liverpool.

9. If a train takes 1 hour 20 minutes to cover a distance of 94·6 kilometres, what is its velocity in centimetres per second?

10. A man can row 3 miles an hour in still water. How fast can he row up and down a stream running at 1½ miles per hour?

11. A steamer travels a mile in 6 minutes with the stream and a mile in 4 minutes against it. What is the velocity of the stream?

12. A boat's crew can row 6 miles an hour with the stream and 3½ miles an hour against it. How fast can they row in still water?

13. A train travels uniformly at 45 miles an hour. Find by a graph (*a*) how far it will go in 20 minutes; (*b*) how long it will take to go 20 miles.

14. A train 176 feet long takes 2 seconds to pass a certain point. What is its velocity in miles per hour?

15. How long would the same train take to pass through a station 120 yards in length?

16. How long would the same train take to pass another train 120 feet long travelling at 45 miles per hour (*a*) in the same direction? (*b*) in the opposite direction?

Section IV.

The object of the "section" is to ascertain the relation between the circumference of a circle and the diameter, and to apply it to practical problems. It follows naturally as further practice in the measurement of length, and introduces for the second time the idea of a ratio.

The circumference of a circle may be measured by a piece of thread and pins, or by the less fiddling plan of passing a string or strip of paper round old pickle jars and jam-pots. In order to revise earlier work on error of measurement, the class should be led to suggest passing the string four or five times round, and taking one-fourth or one-fifth of the whole length as the circumference. The measurement of the diameter offers no difficulty. The value of the ratio found by experiment should then be calculated, and the students should be led to see that the result must not be expressed with more accuracy than is justified by the measurements. If ten students make five measurements each, and the results are tabulated, the conclusion can be drawn that the ratio is practically constant.

There is nothing to be gained and much to be lost in accuracy of thought and expression by making the actual value of π the aim of the measurements. When they have a clear notion of the meaning the true value can be given to them.

At this stage the attention of the class may be directed to incommensurable quantities. Reference may be made to the ratio of the inch to the centimetre in Section III., and the need of avoiding too many figures in an answer.

The ratio of the circumference to the diameter may again be expressed in "shorthand" as $\frac{c}{d} = \pi$, and examples worked in which c and d have to be found.

Suitable examples are to be found in the distance covered by a locomotive driving-wheel in one or more revolutions. Comparison may then be made between the number of revolutions made by the driving and bogie wheels. From this may be deduced the relation between number of revolutions and diameter or radius.

A useful plan when dealing with students who are engaged in workshops where machinery is used is as follows: Draw a circle on the blackboard. Call this a pulley, say, 3 feet diameter. Suppose this to be rotating at the rate of 100 revolutions a minute, and put the following questions to the class, allowing each one to be worked before proceeding to the next :—

How many revolutions per second? How many revolutions per hour?

Find velocity of a point on rim in feet per minute. Find velocity of a point on rim in feet per second. Find velocity of a point on rim in feet per hour. Also in yards.

Suppose a belt passes round the pulley, what is the velocity in feet per minute? Let the belt pass over another pulley. How fast is rim of second pulley moving? If second pulley is 2 feet diameter, how many revolutions per minute? If 4 feet diameter, how many? If 5 feet diameter, how many? If 6 feet diameter, how many? And so on. Hence infer the rule that if two pulleys make N and N_1 revolutions, and have diameter d and d_1, then $\frac{N}{N_1} = \frac{d_1}{d}$.

This gives another type of equation which the pupils will use for finding one quantity when the other three are given.

In order to avoid too slavish reliance upon the formula it will be advisable to ask for some of the questions to be worked out from first principles, showing clearly the argument by which the result is reached. There is so much tendency in mathematics to work in symbols that valuable practice in clear logical thinking and accurate oral and written expression is frequently lost.

It may be useful at this stage to ask the students to define a circle from the method of drawing it. The purpose of such a question is to encourage the students to look back over the ground they have covered. Perhaps it is necessary to point out that while certain explanations of terms, figures, etc., have to be given at the commencement of a lesson, they belong to the teacher, while definitions belong to the pupil, and must be arrived at in his own way. There is more latitude in explanations, which are pictorial. The definition, on the other hand, is logical and precise. Thus D'Arcy Thompson "explains" a straight line as "the path pursued by an ecclesiastic with a bull behind him or a bishopric in front." It seems almost needless to add that the scope of this kind of explanation in the classroom is limited.

The practice of glancing backwards over the subject and making definitions is of such great value that it is worth a little trouble at the outset to train the students in the habits of thought which are necessary. If any difficulty is experienced, therefore, in obtaining a definition in terms of the property of the bounding curve, the following plan may be adopted :—

Place one leg of the compasses firmly at a point A, and make a series of dots fairly close together all round it, instead of the usual curve. Draw a curve freehand through the dots, and ask whether that is a circle, and why. If the reason is still obscure, pass to the first two exercises below, and then endeavour to elicit the definition of the circumference as a locus, but reserve the term "locus" until later. This is a good illustration of the method of widening the "presentation" in order that "abstraction and formulation" may be carried out. The student's difficulty at this stage is frequently due to the fact that he does not understand exactly what is required of him. The enlargement of the "presentation" enables him to compare and contrast, and as a result the characteristic property stands out more sharply.

EXERCISES—DRAWING AND NUMERICAL.

1. Repeat your definition of a circle. Stick a pin in your drawing-paper, make a loop in a piece of thread about 5 or 6 inches long by tying the ends, place the loop over the pin and your pencil, and, keeping the thread tightly stretched, move the pencil point round the pin and as far away as possible from it. What is the curve you have drawn? Give reasons.

2. Place two pins in the paper about 3 inches apart. Make a loop in a piece of thread about 7 or 8 inches long as before, and, placing this loop over both pins, draw another curve in the same way. Is this a circle? Why not?

3. Place the two pins at varying distances apart, and draw the curves. State the definition of a circle again, and try to find a similar definition of the curves you have just drawn.

4. A bicycle wheel makes two revolutions per second when it is going at ten miles per hour. What is the diameter of the wheel?

5. An engine has a belt pulley 18″ diameter, and the belt passes over another pulley 30″ diameter. The 30″ pulley is on a line of shafting which has a pulley 36″ diameter which drives another pulley 24″ diameter on a counter shaft. If the engine is running at 250 revolutions per minute, find (*a*) the number of revolutions per minute of the 30″ pulley; (*b*) the number of revolutions per minute of the 24″ pulley.

6. A pulley 20″ diameter drives another pulley 10″ diameter. The first pulley makes 150 revolutions per minute, and the second 290. What ought the number of revolutions to be per minute in the case of the second pulley? What is the difference? To what is it due? Express the loss as a percentage.

7. Solve Question 25 on the assumption that the slip is 2 per cent. in each case. Do you think that the slip is greater when large or when small pulleys are used? Give reasons.

8. The drum of a colliery winding engine is 13½ feet diameter and 7 feet wide. How many coils of wire rope 1¼ inches diameter can be wound on it, and what is the length?

9. A colliery shaft is 328 yards deep. The winding drum is to be 21 feet diameter, and flat ropes 5 inches wide are to be used. What must be the width of the drum? How many revolutions will it make in raising the cage from the bottom to the top of the pit? If the cage is brought up in half a minute, what is the average velocity?

10. The bobbin of an electromagnet has a barrel 5·4 cms. diameter and 20 cms. long. It is to be wound with wire until the outside diameter of the coil is 2½ times the diameter of the barrel. The wire is 1 mm. diameter. What length of wire will be required approximately? If there are 215 yards to the lb., what weight would you require?

Note.—The problems are placed at the end of each section for convenience. In practice some of them would certainly be worked in the course of the teaching. A careful selection should be made for home work.

(*To be continued.*)

THE I.C.S.

THE I.C.S. is a Correspondence College which, like Bacon, has taken the whole world for its province, and which might well adopt for its battle-cry against ignorance and incompetence the single word "Inspiration." For, judging from its monthly journal, *The I.C.S. Student*, it not only imparts instruction, but fires the student with that divine discontent which triumphantly overrides all obstacles, and reaches the goal by sheer force of character. The College will take you in hand whatever your sphere in life may be; and if you are untrained it will train you; if you are half-trained, it will complete the process; and if by force of trained ability you have already won success, it will help you on to higher achievements. The College "Courses of Instruction" are as wide as its appeal to workers; but its special subject is technical knowledge, for lack of which we are now well on the way to taking a second or even a third place in the international race. We strongly advise those of our readers to whom the above makes any appeal to write for particulars of the I.C.S. work. Address: Kingsway, London.

MODERN SCIENCE NOTES.

BY J. G. M'INTOSH, B.SC., SECONDARY SCHOOL, GATESHEAD.

The Stages of Oxidation.

THE following experiment illustrates very simply and effectively the three stages of oxidation of lead peroxide, and is also well suited for class demonstration. Lead peroxide is sprinkled on a flat-bottomed porcelain basin so as to form a thin layer. The basin, supported on an ordinary triangular tripod, is heated gently and then strongly by the flame from a Bunsen burner placed directly under it. After a few minutes the hottest part of the basin is found to be covered with yellow litharge, PbO, the part immediately above the triangle by red lead, Pb_3O_4, and the colder part beyond by unchanged lead peroxide, PbO_2, the contrast being clearly shown by the yellow, red, and puce areas.

The Smoke Nuisance.

At the opening of the Smoke Abatement Exhibition in Sheffield, Sir Oliver Lodge was the principal speaker. The object of the Exhibition was to direct public attention to smoke-preventing appliances already on the market, and to advance the movement for the purification of air in large industrial districts.

Sir Oliver Lodge condemned as unsatisfactory for household purposes the open gas jet and coal fire, and prophesied that in the future the home would be lighted by electricity, and gas used for heating and cooking. "If," he said, "we all burned purified gas, the atmosphere of the towns would be very different from what it is." We append a short summary of his address.

"I can only hope that one day some town or other in England will try the experiment of having gas made at the coal-pit, and of bringing it in pipes to the place of consumption. This would mean the forbidding of the importation of crude coal into that town. If one town would try that experiment, and it succeeded, other towns would imitate. I hope to live to see that accomplished.

"Two towns are already thinking about it. The times are hopeful. People are realising that things are wrong and must be amended. They realise, too, that there will be no amendment unless they do it—that we are agents with a responsibility and duty upon us, and that the powers above depend on us to use that intelligence with which we have grown, by the process of evolution, for the benefit and salvation of mankind."

Speaking of the general ugliness of large cities, Sir Oliver Lodge said the reason for the lack of beauty in art, in sculpture, or in architecture had to be sought in the defects of society, in the mode of looking at things, in the conception by a community of what was "most worth while." It was knowledge of this fact that had turned the attention of many artists to the conditions of social life. It was this which so greatly influenced Ruskin, who dealt with the problems in a revolutionary and striking manner, which excited ridicule and opposition at the time; but he had laid the foundation of a saner and a more human political economy.

"When we consider life as it is and life as it might be," Sir Oliver Lodge said, "we are struck with the contrast. People now are realising that life as it is is not life as it ought to be; that all this squalor, extreme poverty, dirt, and smoke, and other things among which we are more or less content to live, are not the conditions intended, not the conditions that the human race ought to put up with, but conditions which they themselves have brought about, and which they themselves can mend. The earth is beautiful in the extreme—in places where nobody lives. But in any place where people have decided that they wish to live in large numbers together, for social purposes, for business purposes, for conveniences of all kinds, there they have taken no precautions to keep it beautiful, there they have made it ugly, there they have spoilt the face of the earth."

"It is commonly thought that Ruskin was against science and engineering. That is a mistake. In many respects he had a keen scientific interest, and in one of his writings he explains how he loved a steam-engine, and delighted to see it work. He used to stand and watch the locomotives until they began to scream, and then he ran away from them. And it was the same with other things in machinery. He could not stand machinery when it was put to wrong uses—when, for instance, it was used to produce works of so-called art. 'They are not artistic, they have no humanity or personality about them'—so he said, and he was a good judge. It was a wrong use of machinery and a wrong feeling about science, of which there has been a good deal in the past century. He did not always express himself wisely, and he did nearly always express himself wildly on these subjects; but that was the essence of his teaching. Science half known has done much to disfigure life; but, better known, it can only beautify and adorn it. That is the object of this kind of exhibition—to try to improve the conditions under which we are suffering from misapplied, or ill-applied, or, rather, half-applied, scientific processes."

It was easy, Sir Oliver Lodge continued, to say that smoke was wasteful, that it necessarily meant imperfect combustion. But in practice smoke was not wholly wasteful. It was economical when there was a variable load, when fires had to be banked up because there was little work in hand; it was economical when water had to be heated, when iron plates or armour plates had to be annealed, or in any case where it was necessary to heat a cold surface by means of a flame. Under such conditions a smoke flame was more efficient than a smokeless flame. He suggested as possible remedies for the drawbacks of the present system the use of studs or projections on boiler-plates, so that these studs could get red-hot in the flame, and carry the heat in by conduction. In the household a kettle with a thick bottom, so that the bottom could get red-hot, would be more efficient than the ordinary kind.

Then there was the necessity of recognising that good radiation had to be provided. The radiation from an ordinary flame was due to the carbon in that flame. There was a time when people used the ordinary flame for lighting houses. But there was a much better way in the use of the mantle principle—the putting of something into the flame, which would radiate much better than the carbon that was incidentally there. Something on that principle might be applied to boiler-heating, so as to depend not on the gases alone, though on them too; but for a real radiating solid surface to send the heat into the boilers without any necessity for a smoke-flame to do it in an imperfect manner. But for the future he looked to a more extensive use of electricity, and of purified gas brought to the towns from the coal-producing areas.

Our Query Column.

SOLUTIONS BY A. CLEMENT JONES, M.A., PH.D., SENIOR MATHEMATICAL MASTER, BRADFORD GRAMMAR SCHOOL.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

C. M. Arnold.—To catch a train I have to go 2 miles 528 yards in 26 minutes. How far must I run at 8 miles an hour so that by walking the rest of the way at 4½ miles an hour I shall be just in time?

The most straightforward solution is:—

Let x miles be the distance I had to run, then $(2\frac{5}{11} - x)$ miles is the distance left for me to walk. The times taken for running and walking are $\frac{x}{8}$ and $\frac{2\frac{5}{11} - x}{4\frac{1}{2}}$ hours respectively, hence

$$\frac{x}{8} + \frac{2\frac{5}{11} - x}{4\frac{1}{2}} = \frac{26}{60};$$

that is,
$$\frac{x}{8} + \frac{23 - 10x}{45} = \frac{26}{60}.$$

Hence multiplying these equals by 360,

$$45x + 184 - 80x = 156,$$

or
$$35x = 28;$$

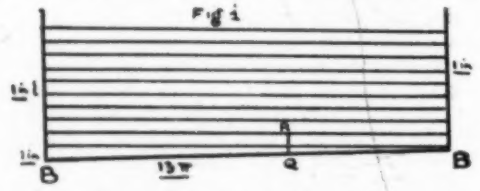
that is,
$$x = \frac{28}{35} = \frac{4}{5}\text{ths of a mile or 1,408 yds.}$$

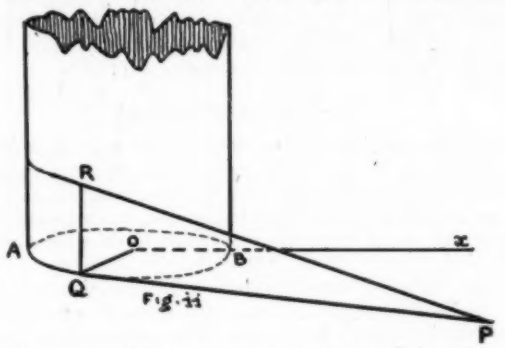
If you wish to avoid the use of the symbol x, you can proceed as follows:—

Suppose he walked the whole distance at 4½ miles per hour: he would then take $\frac{2\frac{5}{11}}{4\frac{1}{2}} \times 60$ minutes to reach the station—that is, 30$\frac{4}{11}$ minutes. He would then be 4$\frac{4}{11}$ minutes late for the train. This amount of time he has to gain by running. Now if he runs a mile instead of walking it he gains $\left(\frac{1}{4\frac{1}{2}} - \frac{1}{8}\right)$ hours—that is, $\frac{7}{72} \times 60$ minutes, or 5$\frac{5}{11}$ min.; consequently to gain 4$\frac{4}{11}$ minutes he must run

$$\frac{4\frac{4}{11}}{5\frac{5}{11}}\text{ miles} = \frac{14}{3} \times \frac{6}{35} = \frac{4}{5}\text{ths of a mile.}$$

Inverell (Australia).—A pole 45 feet high, 1 foot in diameter, is coiled round with a rope 1 inch in diameter to within 5 feet of the bottom. A man takes hold of the end of the rope and unwinds it, keeping the rope taut. How far does the man walk?

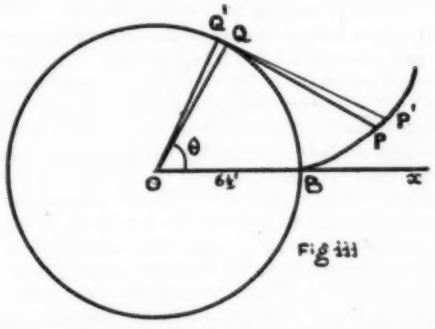
We shall consider the rope to be replaced by a line along its axis. This line will occupy the same position as the thread of a screw traced on a cylinder of diameter 13 inches. The pitch of the screw is 1 inch—that is, it rises 1 inch vertically for each complete revolution. Thus if the surface of the cylinder were laid out flat, BB representing (Fig. 1)

the circumference of the circle, which is a horizontal section at a height 5 feet up the pole, the thread of the screw would be represented by straight lines, as shown in the figure. BB is 13π inches, and thus the angle these lines make with the horizontal is $\tan^{-1}\frac{1}{13\pi}$. Now, the line of the thread of the screw can be found by wrapping a right-angled triangle round the cylinder. One acute angle of the triangle is $\tan^{-1}\frac{1}{13\pi}$, and the side adjacent to this is always horizontal and wrapped round AQB (Fig. 2). The hypotenuse



of the triangle traces on the cylinder the thread of the screw.

Now, the distance the man walks is equal to the distance his hand moves (supposing his hand is 5 feet from the ground) when he takes the vertex P of this triangle and, moving his hand round and round the cylinder on a horizontal plane, unwraps the triangle. Further, the hypotenuse RP represents the rope, which is therefore always taut. In Fig. 2 we have shown the triangle (the angle is much exaggerated) partly unrolled.

This reduces the question to finding the length of the path of P. This path lies in a horizontal plane, and is the same as the path of the end of a string of negligible size when 480 coils round AQB are unwound.



Thus in Fig. 3 if a length PQ has been unwound, PH is perpendicular to QO; and if $\angle QOB = \theta$, the length of QP is $\frac{13\theta}{2}$, for it is equal to QB (this holds equally when θ represents several revolutions). Further, Q is the instantaneous centre of rotation; thus QP is the normal at P to the path of P, and H is the centre of curvature. If Q^1 is a near point to Q, the angle $QOQ' = d\theta$, also the angle between QP, Q^1P^1 is also $d\theta$, since they are respectively perpendicular to OQ and OQ^1. Hence the element of arc PP^1 is QP . $d\theta$; that is,
$$\frac{13\theta}{2}d\theta.$$

Now in the question θ increases from 0 to 960π, hence the length of the curve traced out by P.

$$= \int_0^{960\pi} \frac{13}{2}\theta \,.\, d\theta = \left[\frac{13}{4}\theta^2\right]_0^{960\pi}$$

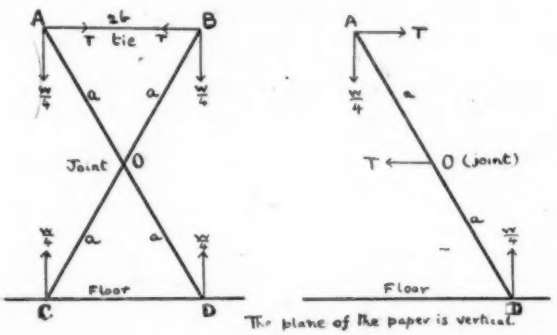
$$= \frac{13}{4} \times 960^2 \times \pi^2 \text{ inches.}$$

$$= 466{\cdot}5 \text{ miles approximately.}$$

Una.—A folding camp-stool consists of two pairs of legs of length $2a$, the legs of each pair crossing each other being *smoothly* jointed at their middle points. The upper ends of corresponding members of the different pairs are connected by bars, and these bars are joined by a strip of canvas of length $2b$. The stool being on a *smooth* floor, a *smooth* box of weight w, whose base is larger than the top of the stool, is placed symmetrically upon it. Calculate the tension of the canvas, and the actions on the pins of the joints. The weight of the stool may be neglected. (Inter. Sci. 1908.)

The floor is smooth, hence the pressures of the floor on the four ends of the legs are vertical. By symmetry they are equal. Considering the box and stool as a system of bodies, the only other external force is w, the weight of the box. This acts vertically. Hence each pressure is vertical and equal to $\frac{w}{4}$.

Again, each pair of legs lies in a vertical plane. There are no horizontal forces in the direction of the bars. We neglect these and replace the canvas by two ties connecting the top ends of the legs. The tension of the canvas will be the sum of the tensions of the two ties.



Since the box is placed symmetrically, we can suppose it replaced by four forces, each $\frac{w}{4}$, acting vertically downwards through the four top ends of the legs.

Now consider one of the legs AD. The forces acting on it are—

(1) A force $\frac{w}{4}$ vertically downward at A.

(2) A force $\frac{w}{4}$ vertically upward at D.

(3) The tension T of the tie acting horizontally at A.

(4) The action of the joint at O.

Since (1) and (2) are equal and opposite, and are the only vertical forces, (3) and (4) must be equal and opposite. Hence the action of the joint (which is equal and opposite to the reaction of the leg on the pin) is horizontal and equal to T.

Take moments about O, all the forces being in the vertical plane,

then
$$T\sqrt{a^2 - b^2} = \frac{w}{4} \times b + \frac{w}{4} \times b$$

$$= \frac{w}{2} \times b;$$

that is,
$$T = \frac{w \times b}{2\sqrt{a^2 - b^2}}.$$

Hence the tension of the canvas is $\frac{bw}{\sqrt{a^2 - b^2}}$, and the action at the joint is horizontal and equal to $\frac{1}{2}\frac{bw}{\sqrt{a^2 - b^2}}$.

François.—Solve by the help of determinants the simultaneous equations

$a_1x + b_1y + c_1z = d_1$; $a_2x + b_2y + c_2z = d_2$; $a_3x + b_3y + c_3z = d_3$.

State the conditions under which the three equations (1) have no finite solution, (2) have more than one finite solution.

Solve the simultaneous equations

$$x + wy + w^2z = \tfrac{3}{2}w^2,$$
$$w^2x + 2y - wz = 0,$$
$$wx - w^2y + z = 1 - w,$$

where $w^2 + w + 1 = 0$. (Final B.Sc., 1905.)

Consider the determinant

$$\Delta \equiv \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix},$$

and let capital letters with the same suffix denote the minors of the small letters in this determinant.

Thus $B_2 \equiv \begin{vmatrix} a_1 & c_1 \\ a_3 & c_3 \end{vmatrix}$, where the row and column in the determinant Δ containing b_2 are omitted. Then we have

$$a_1A_1 - a_2A_2 + a_3A_3 = \Delta.$$

Hence $b_1A_1 - b_2A_2 + b_3A_3 = 0$, for the left side clearly represents $\begin{vmatrix} b_1 & b_1 & c_1 \\ b_2 & b_2 & c_2 \\ b_3 & b_3 & c_3 \end{vmatrix}$, which, having two columns alike, is zero. Similarly

$$c_1A_1 - c_2A_2 + c_3A_3 = 0.$$

Further, $d_1A_1 - d_2A_2 + d_3A_3 = \begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix}$.

Now multiply the equations

$$a_1x + b_1y + c_1z = d_1,$$
$$a_2x + b_2y + c_2z = d_2,$$
$$a_3x + b_3y + c_3z = d_3$$

by A_1, $-A_2$, A_3 respectively, and add. Thus

$$x(a_1A_1 - a_2A_2 + a_3A_3) + y(b_1A_1 - b_2A_2 + b_3A_3)$$
$$+ z(c_1A_1 - c_2A_2 + c_3A_3) = d_1A_1 - d_2A_2 + d_3A_3,$$

or
$$\Delta x = \begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix};$$

that is,
$$x = \begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix} \div \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}.$$

Similarly

$$y = \begin{vmatrix} a_1 & d_1 & c_1 \\ a_2 & d_2 & c_2 \\ a_3 & d_3 & c_3 \end{vmatrix} \div \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix},$$

and
$$z = \begin{vmatrix} a_1 & b_1 & d_1 \\ a_2 & b_2 & d_2 \\ a_3 & b_3 & d_3 \end{vmatrix} \div \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}.$$

1. When the determinant $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ is zero, values of x, y, and z are infinite, provided neither of the numerator determinants vanish at the same time.

2. There can only be more than one finite solution when two of the equations are practically the same—that is, when, for instance,

$$a_1 : a_2 = b_1 : b_2 = c_1 : c_2 = d_1 : d_2,$$

in which case there is an infinite number of solutions.

$$x + wy + w^2z = \frac{3w^2}{2},$$

$$w^2x + 2y - wz = 0,$$
$$wx - w^2y + z = 1 - w,$$

where $1 + w + w^2 = 0$.

The given condition gives us

$$(1 + w + w^2)(w - 1) = 0,$$

unless $w = 1$; that is, $w^3 - 1 = 0$, or $w^3 = 1$. Hence w and w^2 are the two imaginary roots of unity.

Multiply the three equations by $\cdot 1$, w, and w^2 respectively. They become

$$x + wy + w^2z = \frac{3w^2}{2}. \quad . \quad . \quad . \quad . \quad . \quad . \quad (i)$$

$$x + 2wy - w^2z = 0. \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(ii)}$$
$$x - wy + w^2z = w^2 - 1. \quad . \quad . \quad . \quad . \quad \text{(iii)}$$

Our querist can use the determinant solution given above. It will be good practice in finding the value of determinants to do so, and compare answers with those found. The equations in the form now found are so simple that the ordinary process is much shorter.

Subtract (ii) from (i), and we get

$$2wy = \frac{w^2}{2} + 1,$$

or
$$y = \frac{w^2 + 2}{4w} = \frac{w^2 - 1}{4}.$$

Add equations (i) and (iii), thus—

$$2x + 2w^2z = \frac{5w^2}{2} - 1. \quad . \quad . \quad . \quad . \quad . \quad \text{(iv)}$$

Add (ii) and (iii) to -1 times the first, and

$$x - w^2z = -\frac{w^2}{2} - 1, \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(v)}$$

or
$$2x - 2w^2z = -w^2 - 2.$$

Add and subtract (iv) and (v), and we get

$$x = \frac{3w^2 - 6}{8}, \; z = \frac{7w^2 + 2}{8w^2} = \frac{7 + 2w}{8},$$

the values of w and w^2 being $\frac{-1 \pm \sqrt{-3}}{2}$.

Nostell Friary.—(*a*) Find the least value of $x + \frac{n^2}{x}$ when n is a positive whole number.

(*b*) Of all positive values of x find that for which $\frac{48x}{(x+4)^2}$ takes its greatest value, and explain how the value of the fraction changes as x increases from zero to a very large value (for example, 10,000).

(*a*) The expression $x + \frac{n^2}{x}$ can be written thus—

$$\left(\sqrt{x} - \frac{n}{\sqrt{x}}\right)^2 + 2n.$$

As n is positive, and all square quantities are positive (provided x is real), the least value of this expression occurs when $\sqrt{x} - \frac{n}{\sqrt{x}}$ is zero, which is the least positive number.

In this case $x = n$, and the value of the expression is $2n$.

(*b*) Let
$$y = \frac{48x}{(x+4)^2},$$

then
$$y(x^2 + 8x + 16) = 48x.$$

Hence
$$y \cdot x^2 + 8x(y - 6) + 16y = 0,$$

therefore
$$x = \frac{-4(y-6) \pm \sqrt{\{16(y-6)^2 - 16y^2\}}}{y}$$
$$= \frac{-4(y-6) \pm 4\sqrt{36 - 12y}}{y}.$$

If then x is real, the greatest value y can have is 3, so that the quantity and the radical may be positive.

In this case $x = 4$.

It is evident that when x is positive the value of the function y is also positive—that is, for positive values of x the value of y is always greater than zero, but the value of y is always less than 3. Hence as x increases from zero to 4, y increases from zero to 3. It then steadily decreases, but never becomes zero until x is infinitely large. It should be noted that x occurs in the second degree as the denominator, and only in the first as the numerator, so that when x is large the numerator is small compared with the denominator.

If the graph of $y = \frac{48x}{(x+4)^2}$ is drawn, the curve, after rising a distance 3 units above the x axis, will then gradually approach the x axis, and will, when x is large, practically coincide with it. The axis of x is called an asymptote to the curve.

The other expression you noted—namely, $1 + 7x - 3x^2$—follows as (*a*) of this solution.

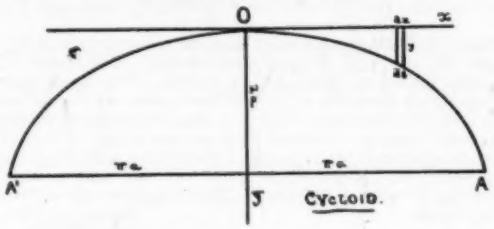
$$1 + 7x - 3x^2 = \tfrac{1}{3}\{3 + 21x - 9x^2\}$$
$$= \tfrac{1}{3}\{3 + \tfrac{49}{4} - (3x - \tfrac{7}{2})^2\}$$
$$= 5\tfrac{1}{12} - \tfrac{1}{3}(3x - \tfrac{7}{2})^2,$$

which is greatest when the positive quantity $(3x - \frac{7}{2})^2$ is zero.

Nedmac.—Find the surface and volume of the reel formed by the revolution of the cycloid round the tangent at the vertex.

$$x = a\theta + a \sin \theta.$$
$$y = a(1 - \cos \theta).$$

The equations for the cycloid as given refer it to the tangent at the vertex as x axis, and the normal at the vertex as y axis. At the vertex $x = y = 0$, and hence $\theta = 0$, and at A, since $y = 2a$, we have $\theta = \pi$, and $x = a\pi$.



The surface required is consequently

$$= 2\int_{\theta=0}^{\theta=\pi} 2\pi y ds = 4\pi \int_{\theta=0}^{\theta=\pi} y ds,$$

and the area

$$= 2\int_0^{a\pi} \pi y^2 dx = 2\pi \int_0^{a\pi} y^2 dx,$$

since the curve is evidently symmetrical about θy.

By differentiation

$$\frac{dx}{d\theta} = a + a\cos\theta = 2a\cos^2\frac{\theta}{2},$$

$$\frac{dy}{d\theta} = a\sin\theta = 2a\sin\frac{\theta}{2}\cos\frac{\theta}{2}.$$

Hence
$$\left(\frac{ds}{d\theta}\right)^2 = \left(\frac{dx}{d\theta}\right)^2 + \left(\frac{dy}{d\theta}\right)^2$$
$$= 4a^2\cos^2\frac{\theta}{2}\left(\cos^2\frac{\theta}{2} + \sin^2\frac{\theta}{2}\right)$$
$$= 4a^2\cos^2\frac{\theta}{2},$$

or
$$\frac{ds}{d\theta} = 2a\cos\frac{\theta}{2}.$$

$$\text{Surface} = 4\pi\int_0^{\pi} 2a\sin^2\frac{\theta}{2}\cdot\frac{ds}{d\theta}\cdot d\theta$$
$$= 16\pi a^2\int_0^{\pi}\sin^2\frac{\theta}{2}\cos\frac{\theta}{2}\,d\theta$$
$$= 16\pi a^2\left[\frac{2\sin^3\frac{\theta}{2}}{3}\right]_0^{\pi}$$
$$= \frac{32\pi a^2}{3}.$$

$$\text{Volume} = 2\pi\int_0^{\pi} 4a^2\sin^2\frac{\theta}{2}\cdot\frac{dx}{d\theta}\cdot d\theta$$
$$= 2\pi\int_0^{\pi} 4a^2\sin^2\frac{\theta}{2}\cdot 2a\cos^2\frac{\theta}{2}\cdot d\theta$$
$$= 4\pi a^3\int_0^{\pi}\sin^2\theta\cdot d\theta$$
$$= 2\pi a^3\int_0^{\pi}(1 - \cos 2\theta)d\theta$$
$$= 2\pi a^3\left[\theta - \frac{\sin 2\theta}{2}\right]_0^{\pi}$$
$$= 2\pi^2 a^3.$$

Papers for Teachers of Infants.

THE EARLY EDUCATION OF CHILDREN.*

BY CLARA E. GRANT, DEVONS ROAD INFANTS' SCHOOL, BOW, E.

Stories.

IN Miss Plaisted's opinion these will play an even larger part than before, and will include fairy and nature lore, and a few biographies, though we doubt whether the lives of writers—for example, Kipling, Tennyson, and Stevenson—will make much appeal to such young children, who are scarcely conscious of "writing," in the sense of composing poetry and prose.

Bible Stories.

We are glad to see a plea made for Bible stories as an integral part of infants' education. These, of course, are usually given in English schools as religious teaching, and if their full value, spiritual, human, and literary, were universally realised, and the teaching universally given on wise psychological lines, we should perhaps see an end to the irreligious strife which has so lamentably gathered round them.

Poetry.

Much is made of the value of poetry in response to the appeal of the child's instinctive love of rhyme and rhythm, and many valuable suggestions are given, together with an exhaustive list of poems which may be learned either wholly or in part; but we still feel that for very young children, unless they live amongst cultured people and beautiful natural surroundings, the "nature" appeal is a little too strong. There is first the danger of confusing a child's ready memory and apparent response to suggestion for the real thing; nor are we sure that it is wise to encourage the mere rhyming instinct in young children, to whom poetic form must be a difficult form of expression. The thought must also of necessity be determined by the form of expression, so confusing the real issue—for example,—

> "There's a primrose down in a mossy wood
> That grows by a daisy fair,
> And these little flowers are always good
> When any one passes there."

A really remarkable little poem on a crocus, entitled, "To the Light," is given by a child of seven, ending, however, with a very childlike ending about the schoolboy:—

> "He stayed so long looking in at the gate
> That I very much fear he made himself late."

Correlation of Subjects.

Some wise words of warning are given against that ill-advised straining after correlation which has worked so much havoc in our schools. Miss Plaisted favours, on the whole, the Herbartian plan of taking the story as the "core" subject, and gathering round it the "reading, number, writing, nature, and expression lessons." In the scheme for a year's work, however, the author confines the correlative subjects chiefly to stories, poetry, nature and observation lessons, pictures and handwork; and this seems to us the best method, and we agree that it seems desirable to change the central pivot, using story or nature lessons just as convenience directs. As Miss Plaisted wisely says, "It matters little what our 'centre' may be—a story, a nature lesson, a picture, an occupation, or an idea—provided always that our point of departure is within the child's sphere of interest." With respect to the correlation of reading, writing, and arithmetic with the "central idea," we have to remember that these are subjects bristling with innate technical difficulties of their own, demanding the most careful graduation of steps, especially in the earlier stages, and in trying too hard to draw them in as correlative exercises we may violate equally important laws in the subjects themselves. Correlative reading, for example, may introduce difficult and unstudied words long before the children are ready for them, and an excessive correlation also strains the power of a young child's mind, which is largely fragmentary, and which can only be rendered capable of cohesive effort by very gradual stages.

The Teaching of Reading.

Whilst theoretically Miss Plaisted endorses the corroborative view of the theorists that reading were better postponed until the age of six or seven, she acknowledges that, owing to the shortness of the school life in our elementary schools, we have to begin at the age of five. Owing to the fact that classes are usually and wisely changed only once annually, it is obvious that each class must represent twelve varying ages. For example, in olden days (not so far remote) the youngest child who entered Standard I. was barely six, the oldest barely seven, which meant that the youngest children began their formal training at the age of four (allowing the necessary two years for the formal work done in the infants' school). If, in future, the youngest children are to be barely seven when they enter Standard I., then obviously the oldest must be nearly eight; and so, with most of us, we find ourselves obliged, failing this last concession, to make a compromise by ranging our ages from six and a half to seven and a half, which means that even now some children begin formal work at four and a half, though their youngest schoolmates may not begin until five and a half. We make no apology for dwelling on this point somewhat fully, for it is a pivot on which the whole question of training the youngest children must turn, and the teachers of senior departments must realise that with the newer and more enlightened demands of true "infant education" this concession must be made, and, if necessary, their own curriculum modified accordingly. If they are only as content as the infants' teachers have been to work on in faith and hope, they will soon prove the real gain to the children, with whose physical and mental growth we have at last learned to "hasten slowly."

With much that Miss Plaisted says about the teaching of reading we heartily agree. For example, the value of a composite method including the best points of all methods; the need for psychological interest; the difficulty of finding easy primers, because "the difficulty of combining easy gradation with interesting matter seems to be almost insuperable;" the value of "printing" as

* A review of Miss Plaisted's book bearing this title, recently published by the Clarendon Press.

a muscular and manual aid in impressing the reading learned; and especially the plea that, when once the sound function of a vowel and of a consonant has been learned, they should be no longer separated, the vowels, especially the short vowels, being so difficult to articulate alone. Miss Plaisted gives also a useful series of graduated "sound" lessons, and some interesting suggestions for associating sounds with noises made by ordinary objects. We have to be careful, however, not to over-elaborate the processes of teaching reading, or the physiological basis of articulation, or they may involve even more effort than the reading itself. It is probable that in a comparatively short time we shall again learn to simplify our methods of teaching reading, especially if the children begin at a rather later age. The logical method—for example, that by which the words are built up synthetically from their component sounds—is extremely valuable and economical for *learning* new groups of words similarly formed, and to most normal members of the class that method will be valuable both in itself as a mental exercise, and practically as providing a means of attack on the word when reached in the book; but there will still remain the few children to whom the logical method does not appeal, and for these other appeals must be made.

Spelling.

Miss Plaisted rightly warns us that the excessive use of the phonic method must inevitably result in incorrect spelling, and it is here that we differ from her in her fear of the early use of the names of the letters. We forget that, after all, the names have to be acquired for future dictation and spelling, and for some children the repeating of the names of the letters, provided the words are not too long, is a real aid in discovering them; and again, it is not really truthful to tell children that "a" is "a" (as in "at"), when it only has that sound in certain conjunctions. The logical method, again, breaks down, for example, in "you," and so may the visual memory; but there certainly are children who will discover it by simply saying "y o u," and there seems no earthly reason why they should not, especially as it is the "y o u" they will want for future use.

The whole section on the teaching of reading, however, is extremely valuable, and cannot fail to help every teacher anxious either to gain corroboration of the value of her own methods, or to gain new ideas.

(To be continued.)

A TALE FOR THE STORY HOUR.

THE STORY OF CHIRPY, AND HOW THE HEDGE SPARROWS FOSTERED THE CUCKOO IN THEIR OWN NEST.

BY E. A. R. NESBIT.

"AH, this *is* comfortable! There's room to move now," chirped the strong little Cuckoo when he had pushed out poor Gowk, his fellow-nestling. Then he settled himself in the very middle of the nest and opened his mouth very wide to be quite ready for the next dainty morsel the Hedge Sparrows brought home.

He had not long to wait before a caterpillar was popped into his open bill by Hedge Sparrow Father. Cuckoo Baby swallowed the caterpillar as quickly as he could, and opened his bill for another. As his kind foster-father had not one to give him, he began to cry, "More, more," very crossly.

Just then Hedge Sparrow Mother perched on the nest, and put a fly into his little bill. The fly did very well for a change, and he ate it joyfully.

"My dear," said Hedge Sparrow Mother to her little mate, "our nestling has a very fine voice; I hear him quite a long way from our nest. We'll call him Chirpy."

"And a very big appetite," replied Hedge Sparrow Father. "I've just given him quite a fat caterpillar. Greedy Chirpy is a good name for him, I think." And away he flew to hunt again for food for that hungry little Cuckoo.

Hedge Sparrow Mother too flew off fly-catching again.

Chirpy was left alone, but not for long. His good, busy foster-parents soon returned, and each brought him some dainty. All day long for many days they fed him with such food as cuckoos like. And when the garden was very quiet, the young Mother Cuckoo would hover near the nest to make sure now that her dear egg had been hatched properly, that her Baby Cuckoo was well cared for.

Chirpy grew so fast and so fat that he soon quite filled the little nest. He was very ugly, and looked very like a fat toad till his feathers grew. *Then* he began to be beautiful; and when he was about three weeks old he had a lovely brown feathery coat.

"How handsome our nestling is now!" remarked Hedge Sparrow Mother with pride to Hedge Sparrow Father one fine day.

"Yes," said the Father-bird, preening his own pretty brown feathers with his delicate, pointed beak. "Don't you think his coat is rather like mine?"

"Very like yours," said his little Wife. "What a pity he'll turn gray like his Mother!"

"Ah, you always admired brown, my dear," twittered he gaily as he darted at a fly, caught it, and gave it the little Mother as a token of his affection.

Seeing the fly eaten vexed greedy Chirpy so much that he fluttered out of the nest. His angry chirps quite frightened his foster-father and mother, who spoilt him dreadfully, and they flew off in a hurry to find something nice with which to coax him into a good temper. When they came back, one with a big hairy caterpillar, the other with a tiny snail, for him to eat, he was sitting on the wall in a very cross mood.

It was soon after this that Maggie ran to Bob, who was picking the dead roses off the bushes in the rose walk.

"O Bob," panted she, her eyes sparkling with fun and her cheeks rosy with the haste she had made, "couldn't you come with me?"

"I can't; 'tisn't six. What's happened?"

"The other Cuckoo," cried Maggie; "I feel sure it's the other Cuckoo."

"What other Cuckoo?" asked Bob.

"The one that turned our Gowk out of the nest, you know."

"Where did you see it?" asked Bob, snipping off a dead rose.

"You see," explained Maggie, "this afternoon Cook gave me a cake all to myself—lovely! all currants and sugary! I thought I'd take it to your mother, because, when she comes here on ironing days, she lets me iron my doll's things, and never says, 'Run along, do.'"

"But about the Cuckoo?" said Bob, thinking Maggie rather slow.

"Well, I'm telling you," said Maggie. "I took the

cake to your mother, and then, on your garden wall, I saw a brown bird just like our Gowk, and it opened its mouth wide as Gowk does when I feed him; and on the big brown bird's back a little brown bird perched, and the little brown bird put food in the big brown bird's mouth. It was the funniest, prettiest thing I ever saw."

"You're right, Maggie. It was the other Cuckoo, and the Hedge Sparrow was feeding it. That's the way he does it; or else he sits on the Cuckoo's outspread wing. Is that all?"

"Not quite," said Maggie. "I hid in the currant bushes, and kept very still."

"That's the way," broke in Bob, with an approving nod. "Keep still—that's it. Watch, and you'll see birds do strange things."

"I kept still," said Maggie—"I hate being still, it seemed awfully long—then another little brown bird came and fed the Cuckoo."

"The other Hedge Sparrow," said Bob.

And then said Maggie, "I heard a cry—'Kwik-wik-wik!'"

"Did you see a big *gray* bird?" asked Bob eagerly.

"No, I only heard the cry," said Maggie. "What was it?"

"That was the Mother Cuckoo on the watch," said Bob.

"But Gowk is *brown*, and so was this big bird on the wall," said Maggie, looking puzzled.

"They'll have *gray* feathers after they moult next year. You won't know your pet Gowk when he comes from his travels next spring."

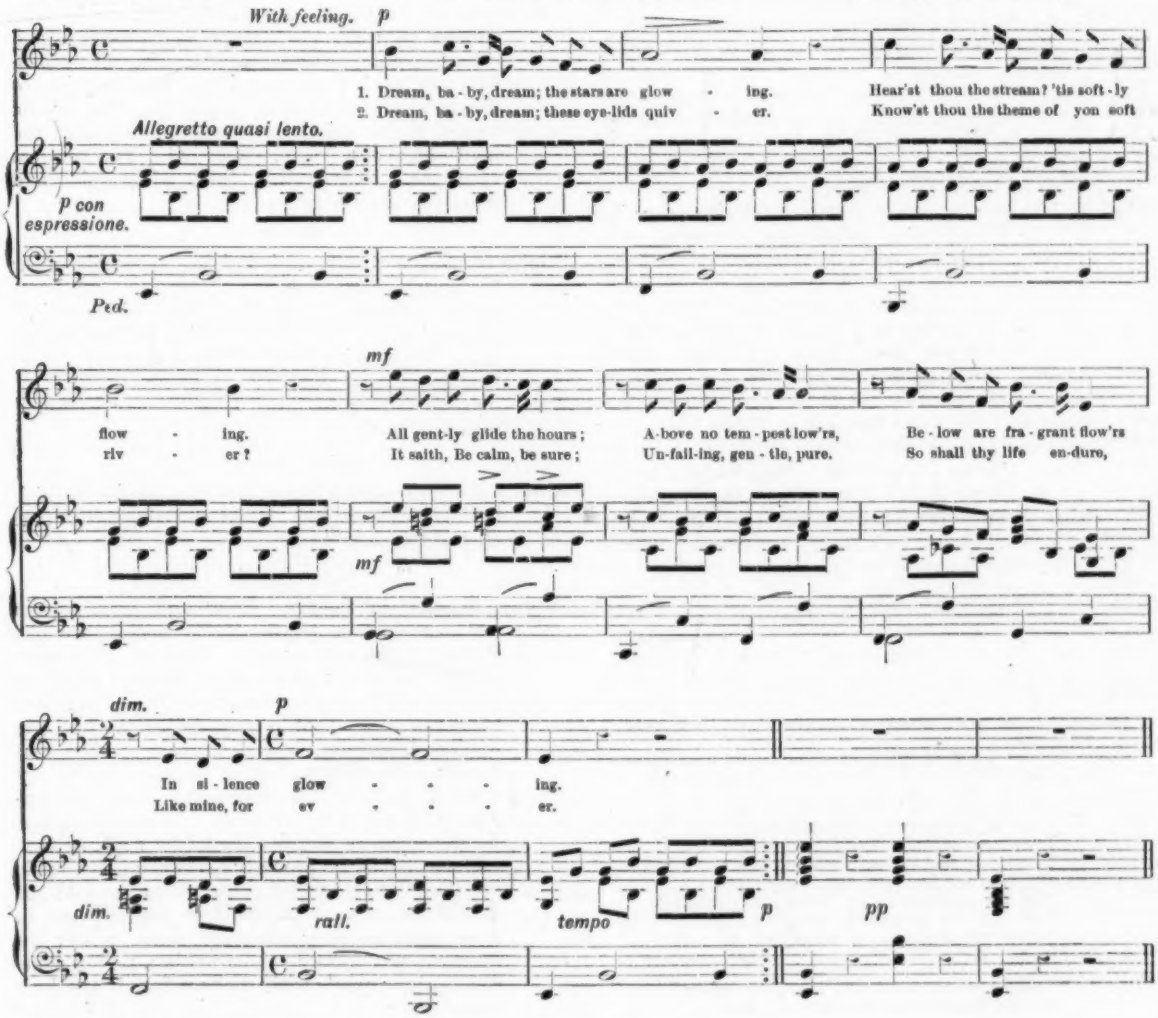
At that moment the clock struck six. Bob gathered up his tools.

"Don't go. Come and see Gowk and Teddie," begged Maggie.

"Not now," answered Bob. "I must be off;" and added, laughing, "There's that cake, all currants and sugar, at home, you know." And Bob went to his tea, singing the old rhyme,—

"In April cuckoo sings her lay,
In May she sings both night and day,
In June she loses her sweet strain,
In July she is off again."

A CRADLE SONG.

Words by B. W. Proctor. *Music by* F. H. Squires, F.R.C.O.

With feeling.
p
1. Dream, ba - by, dream; the stars are glow - ing. Hear'st thou the stream? 'tis soft - ly
2. Dream, ba - by, dream; these eye-lids quiv - er. Know'st thou the theme of yon soft
Allegretto quasi lento.
p con espressione.
Ped.
mf
flow - ing. All gent-ly glide the hours; A-bove no tem - pest low'rs, Be - low are fra - grant flow'rs
riv - er? It saith, Be calm, be sure; Un-fail-ing, gen - tle, pure. So shall thy life en-dure,
mf
dim.
p
In si - lence glow - - - ing.
Like mine, for ev - - - er.
dim.
rall.
tempo
p
pp

MORAL TEACHING FOR INFANTS AND JUNIORS.

BY MABEL A. BROWN.

Scheme for June.

Central idea—Truthfulness and honesty.

Divisions of Subject.

Weeks 1 and 2. Speaking and acting the truth. Point out ways in which we may be untruthful besides telling a direct lie—keeping silence when we ought to speak; letting others bear blame which we ourselves should take; telling tales, often not absolutely true. There is one very good rule to adopt in telling tales—to ask oneself, "Is it true?" then, "Is it kind?" then, "Is it necessary?" It is surprising to what a minimum talebearing would be reduced if these rules were always adopted. Warn against extravagant talk, exaggeration in detail, to which most children are prone. Then, again, any form of copying work—getting results by unfair means. These ideas should form the subject-matter of a definite lesson, as children have usually very hazy notions as to the precise meaning of truth and untruth.

Week 3. Keeping a promise—acting up to one's word. Discuss meaning of phrase, "On my word of honour." Speak of the honour of belonging to a good family—a family with a reputation for uprightness and righteous dealing; the honour of a great nation; the honour of a school; the traditions of famous schools, etc.

Week 4. Honesty in money matters. Discuss meaning of fair trade, value for money, sweating, with juniors. These subjects are quite capable of being explained to the children intelligibly, if the very rudimentary ideas only are taken. Rule to be adopted in finding lost goods. Question, "Is it mine?" If not, then I have no business with it. Discuss responsibility of positions of trust—such responsible persons must be *trustworthy*. The proverb, "Honesty is the best policy," is surely not the highest plane upon which to introduce this subject to the children. Personally, I should not make use of it. If it is suggested by a child, then it must be discussed, but the higher plane of honour should be strongly emphasised. Even if we lose materially by being honest,

> "Because right is right, to follow right
> Were wisdom in the scorn of consequence."
>
> TENNYSON.

Quotations.

(Recommended to be learned by juniors.)

> "Let us then be what we are; speak what we think, and in all things
> Keep ourselves loyal to truth and the sacred professions of friendship." LONGFELLOW.

> "Ah! if our souls but poise and swing
> Like the compass in its brazen ring,
> Ever level and ever true
> To the toil and the task we have to do,
> We shall sail securely, and safely reach
> The Fortunate Isles, on whose shining beach
> The sights we see and the sounds we hear
> Will be those of joy and not of fear."
>
> LONGFELLOW.

> "Stand upright, speak thy thought, declare
> The truth thou hast, that all may share;
> Be bold, proclaim it everywhere,
> They only live who dare."
>
> L. MORRIS.

Recitation.

"Always Speak the Truth" (*Waverley Reader I.*).

Five Things to Note.

> "If you your lips would guard from slips,
> Five things observe with care—
> Of whom you speak, to whom you speak,
> And how, and when, and where."

Texts.

"Keep thy tongue from evil, and thy lips that they speak no guile." "Out of the abundance of the heart the mouth speaketh." "Keep thy heart with all diligence, for out of it are the issues of life."

Hymns.

"God is always near me," and "My heart is God's little garden," by Eleanor Smith (*Songs for Little Children*). "We are but little children weak," and "Lamb of God, I look to Thee" (*Ancient and Modern*).

Scripture Narratives.

The story of Abraham's falsehood (Gen. xii.). The terrible punishment of Gehazi's covetousness and consequent untruthfulness and deceit. The deception of Jacob (Gen. xxvii.). The deception of Joseph's brethren (Gen. xxxvii.). The untrue report of the spies who were sent to search the land of Canaan (Num. xiii., xiv.). The trespass of Achan (Joshua vii.). Story of Ananias and Sapphira (Acts v.).

Stories.

Stories of King Arthur and his knights, especially of Sir Bedivere's unfaithfulness as told in "The Passing of Arthur." "The Pied Piper of Hamelin" (Browning). "The Silver Shilling" (Hans Andersen. "It is quite True" (Hans Andersen). "The Emperor's New Clothes" (Hans Andersen).

Note.—Several stories teaching honesty may be found in school readers.

Object Lessons.

A magnet. The mariner's compass (the needle of which is true to the north). Gold and silver (the true ring of the pure metal).

Nature Study.

Family likeness in flowers. Point out how certain features—certain truths, so to speak—are the characteristics of the various families. The most suitable for study by young children at this time of year are:—1. The daisy family—dandelion, ragwort, goat's-beard, groundsel. 2. The pea family—laburnum, vetches, clover. 3. The rose family—blackberry, apple, cherry, strawberry flowers, etc. 4. The dead-nettle family—snapdragon, toad flax, veronica. Nature calendars for the separate families should be kept, so that each flower can be properly classified. The fruits of the flowers under observation should be looked for, so that the children can see how in some families they are very much alike: for example, pea family—the fruit is a pod of some description; while with the rose family the fruit varies very much. Similarities and differences

like these are eagerly noted by the children, and lead them in the right way to study nature.

Kindergarten Occupations.

Juniors.—*Ruler-drawing.*—A bar magnet. *With compasses and ruler.*—A mariner's compass (eliminate all unnecessary lines).

Brushwork.—Studies of dandelion and leaves, clover and leaves, sprays of vetch, sprays of wild rose, cherry blossom (tinted paper), snapdragon. Very simple floral designs may be attempted on such elements as the clover leaf; strawberry flower and leaf; wild rose—leaf, flower bud, and fruit.

Freehand Drawing.—Details of a sweet-pea plant; the tendrils, the stem-clasping leaves; the variously shaped petals; the fruit. Any other flowers may be treated in the same way by children in the lower standards. The dandelion is very good for drawing in detail.

Clay Modelling.—Peas in a pod (closed and opened), modelled on a slab. Broad beans and French beans may be treated in the same way Apple leaves and blossom.

Infants.—*Brushwork.*—Simple studies of the moon daisy, laburnum, vetch, wild rose, and any other flowers studied that may be thought possible.

Clay Modelling.—Cherries, strawberries, peas in a pod, a moon daisy, a strawberry plant.

Drawing.—The simplest flowers may be selected for drawing, and colour should be indulged in to the fullest extent, as long as it is true to nature. June is the month of colour. Poppies make a good free-arm study. Marguerites and corn-flowers, too, are very effective.

COMMONSENSE NEEDLEWORK.

BY J. A. FLEMING.

STOCKINGS.

1. How to Preserve Them.

CHILDREN'S stockings are often torn by dragging them on and off carelessly.

To take a Stocking off Properly.—Turn the top down, and draw the stocking gently off the leg. It will then be wrong side out.

Put the left hand into the stocking, and catch hold of the toe by the thumb and finger.

Take hold of the heel with the *right* hand, and bring the toe back into the stocking by the *left* hand. It will now be ready for putting on.

To put a Stocking on Properly.—Take hold of the heel and slip it on the foot.

Take hold of the *welt* with both hands, and draw it over the foot and up the leg.

Stockings treated in this way last much longer than those that are pulled and dragged on anyhow.

Note.—When stockings are washed, before they are rolled up to put away, the hand should be slipped into each and the fingers *pushed* into the toe, that any little hole or thin place may be the more readily detected. If the hose do not require mending, they should be folded, ready for wearing, in the manner already described.

Afterwards one stocking is laid on the top of the other, and, commencing with the toes, rolled up until the welts are reached, when the outer stocking top is turned back to enclose the whole and to make a neat roll. Those that need mending should be left *un*folded until an opportunity for sewing occurs.

It can then be seen at a glance which are ready for wearing and which are not.

In nothing is a stitch of prevention so much a stitch in time as in connection with stockings. The snapping of only *one* thread makes a large hole in a short time, so the smallest hole should receive prompt attention by neat darning. A disconnected seam should be drawn together and a dropped stitch arrested as soon as discovered.

Thread to match the stocking in colour and texture is the first requisite. Fine thread may be used for small holes in the leg, and coarser for the foot. There is difference of opinion among housewives as to whether stockings should be darned on the right side or on the wrong. On the right side it is easy to see how the darn will look when finished; on the wrong side loose threads may be more easily secured, and *children* can catch up the loops more readily.

Preparation of Work.—Draw the stocking over a darning-egg or flat darner. For a very large hole thread a needle with cotton and fasten it firmly. Oversew the edges of the hole by means of dressmaker's overcasting. Draw the hole as small as possible without puckering the edges, and fasten the cotton off firmly.

This method is not in general use in this country, although it is largely adopted in America.

It is very necessary that the needle be put *through* the loops in this operation.

The Darning.—N.B.—The first set of threads in *all* darning runs parallel with the ribbing or longitudinal loops of the stockingette—that is, they run lengthwise with what corresponds to the selvedge of cotton garments.

The needle must be taken carefully in and out *beyond* the hole above and below, so as to strengthen the thin part that usually surrounds a worn place.

Where the thread turns round to go back a loop is left, which may remain till the stocking is washed, when it may be either cut or left uncut. When all the lengthwise threads are in, the cross threads are woven over and under each separate strand. These cross ones must *also* extend beyond the hole on each side.

If in a hurry, it is better to use double thread than to spoil the basket-like weaving by taking up more than one thread at a time.

Ladders, or "runs," are usually caused by the breaking of a single thread and the consequent running down of the stitch. They often occur on the *leg* of a stocking. A darn, as well as an unsightly appearance, may be prevented by taking up the loose loop at the bottom on a steel crochet-hook, and drawing the thread immediately above it through the loop. Each successive thread or "step" of the ladder is drawn through the loop until the top is reached, when the taken-up loop should be fastened securely, along with the loose loop at the top, on the *wrong* side of the stocking. If the texture be too fine for this mode of treatment, a needle is threaded with suitable thread and run in and out *below* the ladder to secure the end, after which it is darned under and over each *alternate* "step" from start to finish. At the top a loose loop will be found, which must be caught up before the needle turns back to take up the remaining strands. If *two* lines of ribbing have "run," the one being formed by *seaming* and the other by *knitting*, the crochet-needle must be used alternately on the *wrong* side and the *right* side of the stocking, so as to restore the original as nearly as possible.

(*To be continued.*)

French Prize Competition.

1. All French translations **must be received not later than June 7, 1909**, and addressed to:—PRIZE EDITOR, Office of *The Practical Teacher*, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the *coupon* which appears on the Back Wrapper page of the current number. One coupon must be sent for each entry.
3. Competitors should write pseudonym only on MS. Prize-winner will be asked to send name and address for publication.
4. No competitor may take the prize offered more than once in three months.

A Prize of **Half a Guinea** is offered for the best rendering into English of the following extract:—

Peut-être aurait-elle souhaité faire à quelqu'un la confidence de toutes les choses. Mais comment dire un insaisissable malaise, qui change d'aspect comme les nuées, qui tourbillonne comme le vent? Les mots lui manquaient donc, l'occasion, la hardiesse. Si Charles l'avait voulu cependant, s'il s'en fût douté, si son regard, une seule fois, fût venu à la rencontre de sa pensée, il lui semblait qu'une abondance subite se serait détachée de son cœur, comme tombe la récolte d'un espalier, quand on y porte la main. Mais, à mesure que se serrait davantage l'intimité de leur vie, un détachement intérieur se faisait qui la déliait de lui. La conversation de Charles était plate comme un trottoir de rue, et les idées de tout le monde y défilaient, dans leur costume ordinaire, sans exciter d'émotion, de rire, ou de rêverie. Il n'avait jamais été curieux, pendant qu'il habitait Rouen, d'aller voir au théâtre les acteurs de Paris. Il ne savait ni nager, ni faire des armes, ni tirer le pistolet, et il ne put, un jour, lui expliquer un terme d'équitation qu'elle avait rencontré dans un roman. Un homme, au contraire, ne devait-il pas tout connaître, exceller en des activités multiples, vous initier aux énergies de la passion, aux raffinements de la vie, à tous les mystères? Mais il n'enseignait rien, celui-là, ne savait rien, ne souhaitait rien. Il la croyait heureuse; et elle lui en voulait de ce calme si bien assis, de cette pesanteur sereine, du bonheur même qu'elle lui donnait. Elle dessinait quelquefois; et c'était pour Charles un grand amusement que de rester là, tout debout, à la regarder penchée sur son carton, clignant des yeux, afin de mieux voir son ouvrage. Quant au piano, plus les doigts y couraient vite, plus il s'émerveillait. Elle frappait sur les touches avec aplomb, et parcourait du haut en bas tout le clavier sans s'interrompre. Ainsi secoué par elle, le vieil instrument, dont les cordes frisaient, s'entendait jusqu'au bout du village si la fenêtre était ouverte, et souvent le clerc de l'huissier, qui passait sur la grande route, nu-tête et en chaussons, s'arrêtait à l'écouter sa feuille de papier à la main.

From "Madame Bovary," by GUSTAVE FLAUBERT.

RESULT OF THE MAY COMPETITION.

The prize is awarded to "Shekels." (Will "Shekels" kindly forward name and address for publication?)

First Class.—Fiat, Eclaireur, Espérance, Oyster, Nylmat ii., Kram, Avril, Aroer, E. R, May, Jean Bonhomme, Crispus, (Pseudonym illegible), Aimée, Claphani, Cuckoo, Essex, (Pseudonym illegible), E. O., St. Oswald's, Amiens, St. Cuthbert, Trebor, Quimperlé, T. V. D., Mascot, M. O. A., L'Arlésienne, Meadow-sweet, Jeanne, S. M. J. Y., Jaune-rouge, Kismet, Toddy, Ian, W. M. E., Nemo, Phebes, Lethe, Lotus leaf, Anglaise, Dee, Häuschen, Iram, Competitor, Pyth, Rosalind, Aredee, Pheidias, Hyacinth, Dolly.

Second Class.—F. G., Craig Rossie, Nan, Charis, Lorna Doone, Sans espérance, Tasmanian, K. A. M., R. A. H., Emilie, Quinze ans, Perrichon, A. W., Lyndhurst, Gipy, Bransby, Jace.

The prize in the April competition was awarded to Mr. D. Michaels, 15 Cazenove Road, Stamford Hill, N.

REPORT.

Not many very good papers were sent in this month. *S'était laissé mourir* was a puzzle to many. The successful candidate and a few others gave the right touch to the translation. To make a really good rendering it is necessary to preserve in the appeal made by the spokesman of the deputation the simple, straightforward character of the original. It is the speech of a man who is ignorant of the artifices of language, who knows what he wants, goes straight to the point, and flavours his remarks with the picturesque expressions he is accustomed to use in daily life. *Commandant* is not "governor;" it is the name of a military rank, about corresponding to our "major." Many competitors did not know the difference between *la politique*, politics, and *le politique*, politician. In answer to a query, we beg to inform competitors that the names given above are in order of merit.

PRIZE TRANSLATION.

The member for Eauze had seen fit to die. One morning, just as election time came round, a deputation was seen entering the courtyard of Bourdette—small shopkeepers from the town, aged peasants from the neighbouring parishes, in their Sunday clothes, with solemn faces, contracted by the unaccustomed effort of grappling with problems of abstract order.

"Mr. James," said in substance the spokesman of the body, "we have called on you respecting the election. You know the state of affairs: the country is going to the dogs. It is said in the town that the Toulouse lawyer, that charlatan who for two years past has been 'working' our division, will certainly get in if no good candidate comes forward. All the shady characters are for him; honest folks are fearful, so much injustice have they suffered at the hands of those in power. We have found no one to stand; all these gentlemen refuse. Then we thought of you, Mr. James. You have studied; you know the law, and all their tricky ways in Paris. You have great influence. In bygone days your worthy father led us against the Prussians, therefore it is undoubtedly your duty now to march at our head against the shameless creatures who have brought so much misery upon our poor land. We know full well that you are not ambitious; but you will not say us nay. As the governor used to remark, we all know that there is good blood in the veins of the Andarrans ever since they shed it for their country."

This appeal surprised James and dismayed him. He had brought back from his Paris life a large stock of political scepticism; his mental habits rendered him utterly indifferent about politics; he knew himself to be incapable of stormy conflict, as of the unwavering zeal which calls it into being. The local squabbles which daily assailed his ears aroused within him nothing but disgust. Whence should he gain the spirit to conquer that aversion? Where should he find what was lacking in him—that measure of optimism and credulity requisite for the effort demanded of him, the unceasing and fruitless effort of the politician to perpetuate things that have no permanence? "SHEKELS."

Excursions en France. Par Henri Boland. Ouvrage illustré de 70 gravures. (Bibliothèque des Ecoles et des Familles.)

This is a worthy addition to the well-known series in which it appears. The descriptions of French scenery include all that is most worthy of the notice of the tourist, and much that has as yet escaped that notice. The descriptions are somewhat unequal as regards vividness of detail, but all are extremely well done, and in many cases the style reaches a very high order of excellence. The book is a capital one to put into the hands of our French pupils.

SEASONAL LESSONS IN NATURE STUDY.

BY THE REV. ALFRED THORNLEY, M.A., F.L.S., F.E.S., SUPERINTENDENT OF NATURE STUDY TO THE NOTTINGHAMSHIRE AND LEICESTERSHIRE COUNTY COUNCILS.

ANIMAL STUDY.

The Wild Rabbit—*Concluded.*

THERE are two subjects remaining over from our study of the wild rabbit, which lie on the borderland between Nature Study and physiology. They are *Circulation* and *Respiration*. I think it profitable to take them with upper standards, as they lead on naturally to hygiene. The following notes will, I hope, help the teacher to present these subjects effectively. I give below a very simple and brief outline of a lesson, taking for granted some knowledge of physiology on the part of the teacher.

Circulation.

Materials.—A little clotted ox blood; a little fresh blood; a jar of CO_2 gas; two pigs' hearts; a microscopical slide of human blood (this can readily be prepared fresh).

Note.—The pigs' hearts should be so prepared as to leave an inch or so of the vessels attached. The butcher must be told to do this, or he will cut them off close to the heart. The hearts must be well washed, clotted blood removed, and one divided so as to show valves.

(*a*) *Blood the carrier of food.*

1. The structure of blood; what the blood fluid carries (food); how the food gets into the blood-stream (see last lesson); what the corpuscles carry (CO_2 and oxygen). Explain clotting, etc.

2. How the blood exchanges CO_2 for oxygen. Experiment with CO_2 gas. The general structure of the lungs (a microscopical slide might help this). Respiration.

3. The circulation of the blood; proofs; how to tell whether an artery or a vein has been severed.

(*b*) *How the blood circulates.*

1. The structure of the heart; its position in the body.

The points to be made clear are that the heart is a great muscle; that its pulsations are due to its inherent power of "contractility," a property of all muscle. Then the general structure. A diagrammatic sketch will show this best. Then the way in which the blood is fed to the heart and leaves the heart by veins and arteries. It is a common error that veins always contain dark—that is, venous—blood, and arteries red blood. This must be corrected. Veins and arteries must be differentiated by the direction of the flow of blood, to the heart or from it. Their structure might be slightly dealt with; the way in which veins collapse and arteries remain elastic when empty. The valves of the heart can be nicely and simply illustrated by paper models.

2. Examination of a pig's heart.

(i.) A blunt seeker (penholder) should be passed down the various vessels; and then, by feeling, it should be discovered in which chamber of the heart the point is.

(ii.) The thickness of the walls of each chamber in relation to the amount of work each has to do should be carefully noted.

(iii.) The pulse should be explained, and the information that can be obtained from an examination of it.

Note.—The teacher will find this a very useful lesson to give, as when he comes to the lesson on the fish or frog he will be able to give a more satisfactory explanation of respiration under water. I have refrained from treating the subject hygienically, as it would make the lesson too long, and is perhaps scarcely suitable for Nature Study.

[Note.—For the next few months the contents of these Notes will be entirely botanical, at the request of a large number of my readers.—A. T.]

BOTANICAL STUDY.

The Life History of the Bean Plant—*Continued.*

The Root.

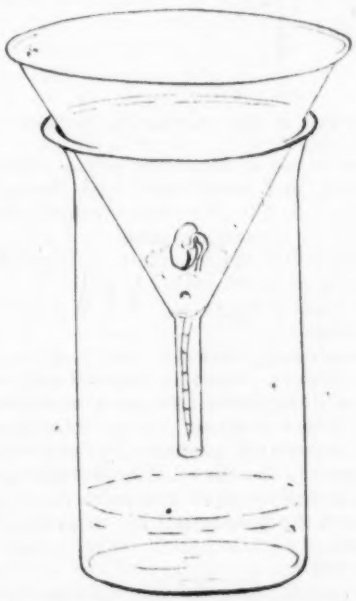
Materials.—Carrots, turnips, radishes, grass, and chickweed. (In washing these roots, do not scrub off all the fine rootlets.) Germinating mustard and cress, germinating beans, glass funnel and beaker.

Notes.—Examination of a germinating bean will show that the root system of a plant is (normally) derived from the primitive root or radicle.

1. The radicle grows *downwards*. This can easily be demonstrated with the apparatus for germinating seeds described in the March number. When the radicle has grown about a half-inch long the bean must be taken out and reversed, so that the radicle points upwards and the plumule downwards. In a few hours the radicle will be seen to curve round until once more it points downwards.

2. How does the radicle grow?

Take a germinated bean in which the radicle is about an inch long, and with a pair of compasses and a rule mark it in tenths of an inch, beginning from the tip. Mark about five divisions. The best way is to prepare a little Indian ink, then make a loop of cotton and dip it in the ink. Next pass the apex of the radicle through the loop until this is opposite the last division. Now draw the loop gently, and a clear little ring will be



Experiment to show Root Elongation.

imprinted at the exact spot. Mark the other divisions in similar manner. When quite dry the bean is inserted, on cotton wool, in the glass funnel, as shown in the

diagram, which will sufficiently explain itself. In a couple of days, remeasure the intervals. Which are the longest? About how much have they increased? In which part of the root does the greatest elongation take place?

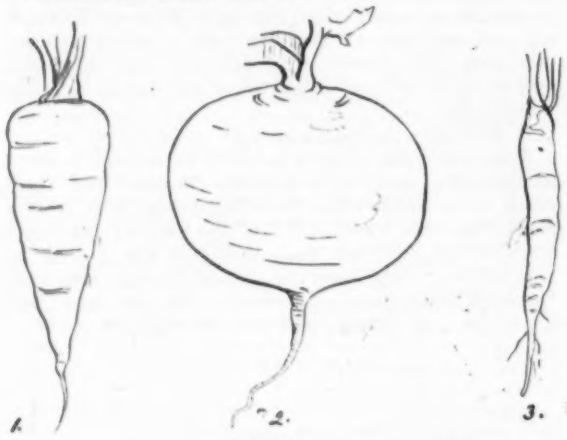
3. Secondary root system.

Note as growth of root continues the production of *secondary rootlets*, and about these note—

(*a*) Their *origin* (endogenous); explain. With a little practice the rind can be removed from a carrot, and the bases of four longitudinal rows of rootlets will be seen arising from the core. Or if a carrot be divided longitudinally the secondary rootlets will be seen arising from the core and piercing through the rind. Viewed externally, a series of transverse slits will be perceived where the rootlets have penetrated the rind.

(*b*) Their *order*. Each kind of root has its rootlets in a definite number of rows. Thus the bean has five rows, the carrot four, etc. These secondary rootlets generally give rise to tertiary ones, and these to others, etc. (All this must be shown by letting the seeds germinate until roots are completely formed.)

4. Different kinds of roots.



Tap Roots.

1. Conical (Carrot). 2. Napiform (Turnip). 3. Fusiform (Radish).

A *tap root* is one in which the primary root is large and dominant, and stored with food (fleshy), and in which the secondary root system occupies quite a subordinate place—for example, carrot.

A *fibrous root* has the secondary root system greatly developed—for example, grass.

Different kinds of tap roots. (See diagram.)

5. Root hairs.

For demonstrating these it is best to let a number of seeds—for example, wheat, or mustard and cress—germinate on a damp flannel or piece of blotting-paper some days before required for the experiment. The "mouldy" appearance produced by the root hairs can easily be shown to the class. The attempt to get plants out of the ground to show the hairs is generally unsuccessful, and the fine rootlets are frequently mistaken for root hairs.

(*a*) *Their origin.*

Here is a case in which the compound microscope may be used, with upper standards. A good slide showing a transverse section of a root through the region of the hairs will be useful. It will then be seen that they are *exogenous* (explain) in origin (compare the endogenous rootlets), and are simply superficial cells modified into hairs. (To higher standards the teacher, if well up in the subject, can give some explanation of the way in which water and salts are absorbed osmotically by these root hairs. See experiment with thistle funnel in last lesson.)

(*b*) *Their growth.*

A growing, elongating root must be watched, and the area occupied by the hairs roughly estimated. Then it must be noted that the hairs, though they never reach the tip, seem to follow it, always keeping a certain distance behind. As they grow in front they die off behind. The utility of this will at once be apparent when the experiment under (2) has been carefully made and considered.

(*c*) *Their use.*

The absorption of water from the soil, with absorbed salts. The best experiments to demonstrate this are (i.) the "wilting" (withering) of seedlings for some time after removal if badly done, owing to the fact that the root hairs get rubbed off, so that absorption becomes very difficult to the young plant until new hairs are produced; and (ii.) the evaporation of some water to show the presence of salts.

(*d*) *The root cap.*—Can be well seen with a good lens. Its use—to protect the very sensitive ends of the rootlets.

(*e*) *Root systems.*—The teacher must explain something about shallow-rooted and deep-rooted plants and trees, and the extensive root systems of some trees and plants.

(*f*) The chief uses of the root can now be summarised—namely, (i.) To hold the plant securely in the ground. (ii.) To absorb water with dissolved salts from the soil. (iii.) To store food—for example, carrots and turnips.

(*To be continued.*)

OUR COOKERY COLUMN.

BY ROSAMOND CANDY, FIRST-CLASS DIPLOMÉE, NORTHERN COUNTIES SCHOOL OF COOKERY.

Recipes for Icings. (See May number.)

Chocolate Icing. *Ingredients.*—One quarter-pound icing sugar, one tablespoonful water, one tablespoonful chocolate, vanilla flavouring. *Method.*—Place sugar and water in saucepan and *warm* it; add a few drops of vanilla and the chocolate. Spread this on the cake and allow to set.

For **Coffee Icing**, add coffee in place of chocolate. For **Orange Icing**, add orange juice in place of water.

Butter Icing. *Ingredients.*—One quarter-pound icing sugar, one and a half ounces butter, one teaspoonful cooking sherry or vanilla. *Method.*—Cream the butter and sugar very thoroughly; add any flavouring desired. Spread on the sandwich-cake.

For ordinary white icing use one half-pound sugar and two tablespoonfuls water.

Recipes as per Method No. IV.

Gingerbread.—A very good and cheap gingerbread was given in the January number; this is always satisfactory if care in cooking is observed.

Breakfast Scones. *Ingredients.*—Two ounces Brown and Polson's Paisley flour, one pound ordinary flour, two ounces butter or lard, one half-pint sweet milk, one small teaspoonful salt, a few currants (optional). *Method.*—Mix the Paisley flour and ordinary flour and salt well together; rub in the butter or lard, and mix quickly

with the milk; turn on to floured board and roll out into rounds. Cut into three-cornered pieces—or cut into round cakes with a cutter—and bake in a very quick oven for five to ten minutes. If a girdle is used, this must be well heated before beginning to mix the scones. The success of scones depends upon the quickness of making and baking. For girdle cakes and dropped scones see March number.

NOTE.—When soda and cream of tartar are used, a teaspoonful of vinegar added to the dough removes the strong taste which soda frequently imparts to scones.

Scones.—The correct proportions for soda and cream of tartar in scone-making are: one half-teaspoonful soda, one teaspoonful cream of tartar, to every half-pound of flour.

In many households scales and weights, which are always more satisfactory, are *not* available. Where this is the case, the following measures will prove helpful:—One level teacupful equals one quarter-pound, one level breakfast-cupful equals one half-pound. This applies to dry goods, such as flour, sugar, etc. One tablespoonful equals one ounce, one dessert-spoonful equals one half-ounce, one teaspoonful equals one quarter-ounce. In liquids a teacupful measures one quarter-pint, a breakfast-cupful measures one half-pint. In solids one dessert-spoonful of butter or lard equals one ounce, or a piece the size of a walnut equals one ounce.

This concludes the different *methods* of cake-making.

The following is a reliable recipe for home-made baking-powder. *Ingredients.*—Four ounces ground rice, four ounces carbonate of soda, three ounces tartaric acid. *Method.*—Mix all the ingredients together, and pass twice through a fine sieve; store in an airtight tin.

THE FEEDING OF INVALIDS.*

Well-cooked food is the best medicine; the recovery of a patient generally depends far more on proper and nourishing food than on the doctor's medicine, valuable as the latter may be.

It should be remembered that the smallest details are quite as important as general principles. The best nurse is she who takes a pleasure in knowing and carrying out these details.

It is very important, as far as possible, to humour the patient's likes and dislikes; therefore it is useful to have at one's command several ways of preparing one dish. For instance, if beef-tea or milk be objected to in one form, it may be made palatable in another. A patient should never be forced to take anything he or she does not really care for.

Above all things, try to be a cheerful nurse. Do not consider anything a trouble. It should be a pleasure to be able to minister to the wants of others, for the recovery of an invalid depends not only on the good food and attention, but on calm and cheerful surroundings. There is an old proverb which may be safely repeated here, and which reminds me that "the three best doctors are *Dr. Diet, Dr. Quiet,* and *Dr. Merryman.*" †

In cooking for invalids the following are the principal points to be borne in mind:—

1. No cooking must be done in the sick-room itself. 2. Scrupulous cleanliness must be preserved. 3. The meals must be served at regular intervals. 4. Dishes should be prepared in small quantities, as the appetite of an invalid is very variable, and what is liked one day may be rejected and disliked the next. 5. Everything should be simple and attractive, and nicely served with clean tray-cloth and the brightest of silver and glass. 6. Food served in a slovenly way will be quite enough to take away the little appetite an invalid has.

Beef-tea, eggs, and *milk* are considered the staple articles of invalid dietary. There are many methods of serving these.

Beef-tea (1). *Ingredients.*—One half-pound beef steak, one half-pint water. *Method.*—Shred the meat, removing all fat and gristle; pour over the cold water; allow this to stand in a jar for twenty minutes. Cover the jar with paper, and then place on the lid, and put the jar into a pan of boiling water. Allow the beef to simmer for two and a half hours. *Beef-tea must never boil.* (This will make enough for two cupfuls.)

N.B.—Veal and chicken tea are made in the same manner. Salt must not be added unless by the doctor's orders. Remove all fat with blotting-paper. A little cayenne and celery salt may sometimes be added before serving. This makes the beef-tea more savoury—if allowed.

Beef-tea, jellied (2). *Ingredients.*—One half-pint beef-tea (as per recipe No. 1), one half-ounce isinglass, one glass sherry, salt or sugar to taste. *Method.*—Dissolve the isinglass in the warm beef-tea; add the sherry (or ginger wine) and the salt or sugar. Turn into wetted mould, and allow to cool; the mixture will stiffen like ordinary jelly.

N.B.—Sugar is often added in place of salt. This is done in many hospitals for children, having been proved more palatable.

Raw Beef-tea (3). *Ingredients.*—One half-pound lean beef, a half-dozen drops lemon juice, a little water, a pinch salt. *Method.*—Shred the beef, removing all fat; place in a jar; add salt and lemon juice and enough water to cover the beef. Allow to stand for two or three hours. Pass through a strainer, pressing the beef well to get out all juices, and serve in a tinted glass.

The next onward step from beef-tea is broth. Those chiefly used are made from mutton, chicken, veal, or calf's foot, and a very nutritious broth is made also from eels.

Mutton (or Veal) Broth. *Ingredients.*—Scrag end of mutton or knuckle of veal, three pints water, pepper and salt to taste, a small onion, a small turnip, bunch of herbs (if approved), one half-teacup pearl barley. *Method.*—Place all in a pan, and bring gently to boiling-point, and simmer for two hours; strain, and put aside to cool. Remove all fat when required to serve, and reheat.

Calf's-foot Broth (very nutritious). *Method.*—A foot (that is, a calf's) should be well cleaned and allowed to stew in a pan with three pints water and a slice of lemon until the mixture is reduced to one-half. The liquor is then skimmed and set aside to cool. It is next warmed gently, and to this is added a lump of sugar, a small piece of butter, and a little grated nutmeg, and, lastly, a well-beaten yolk of egg, and the whole is stirred until it thickens.

N.B.—Care must be taken that the broth does not *boil,* or the egg will curdle.

Chicken Broth. *Ingredients.*—One fowl, one and a half pints water, one half-teaspoonful salt, one dessert-spoonful barley, one quarter-teaspoonful peppercorns. *Method.*—Divide the chicken into pieces (saving the breast for fillets); place in a pan with the water and other ingredients, and bring slowly to the boil, and simmer gently for two hours. Strain before serving, and remove every particle of fat.

N.B.—Eel broth is made in the same manner as chicken broth, and is considered very nutritious.

(To be continued.)

* Those of our readers who have *not* been accustomed to make their cakes in the wholesome way described by our contributor will doubtless come to require a course of invalid dishes. Hence the following article.—ED.

† Possibly Dr. Cheeryman would be a more suitable companion for the other two medical men. Merry people are inclined to overdo the innocent merriment. We have ourselves suffered from them.—ED.

Our Readers' Column.

STUDIES OF BOOKS THAT ARE WORTH WHILE.

BY SUSAN CUNNINGTON.

III.—Charles Dickens (1812–70).

1. "Bleak House." 2. "A Tale of Two Cities."

IN these two novels we have examples of the very different kinds of story-telling—the novel with a purpose, and the historical novel. *Bleak House* is a fine example of the peculiar type which Dickens made his own. It was written in 1853, and stands about midway in the list of long novels, apart from short stories, which appeared between *Oliver Twist* in 1837 and the unfinished *Edwin Drood* in 1870.

Like others of his works, *Bleak House* is crowded with characters; full of vivid description of persons and places and conditions; rich in its succession of phases of London life; vigorous and exuberant in movement, and quite independent of a strong plot for its dramatic interest. An evil or abuse at which to level his artillery of scorn—in this case the delays of the High Court of Chancery; a slow working-out of the main thread of the story, with many digressions amongst minor circumstances, grave and gay; a careful and minute depicting of simple virtues and humble endeavours—these, with moving appeals now to a sense of the comic and now to our tenderer feelings:—with such materials and methods the great writer composed the works which have been the delight of his contemporaries and their successors.

In accordance with the fashion of the mid-nineteenth century in book publishing, *Bleak House* came out in monthly numbers. The experienced reader will perhaps thus try to account for the many occasions when a crisis or a climax seems to be approaching in one part or another of the story, though often it in no way advances the development of the main theme.

Glancing at the book as a whole, we see that the "purpose," the condemnation of the delays in Chancery, worked out in the gradual deterioration of the character of Richard Carstone as he waits for the unearned and expected wealth, is foreshadowed and emphasised by the pathetic figure of Miss Flite and the angry misery of the man from Shropshire. London, and the sadder side of its citizen life in the early part of last century; its unguarded and uncleansed streets; its dingy courts and unspeakable graveyards; its neglected and unfortunate children, of whom there are still too many, represented in Jo, the crossing-sweeper, and little "Charley;" the strange industries and pursuits of unconsidered units of the population; and, removed from the sordid externals, but bound up with the no less sordid tragedies of the story, the occupants of Bleak House and the grotesquely-stately figures of Sir Leicester and Lady Dedlock.

None of the other novels of Dickens is so rich in quaint and curious characters; quite subordinate personages of the story are drawn and presented with elaborate care and fullness. A thin thread of connection combines these personages together, and unites them with the main plot.

The sensational element is supplied by the suggested secret of Lady Dedlock's earlier life and its outcome; and a touch of the violently tragic appears in the terrible end of Krook the drunkard by spontaneous combustion. A lighter but not simply amusing strain is introduced by means of the three ludicrous but unfortunate households of the Skimpoles, the Jellybys, and the Pardiggles. In the first, underneath the apparently impartial delineation, is the author's reprehension and disdain for the shirking of responsibility and selfish unthrift. In the latter two his condemnation of the philanthropy and religion which exhaust themselves in efforts for remote objects and ignore the nearer claims of home is expressed.

The stirrings of the social conscience after the Chartist struggles gave rise, not only to much wise and intelligent and laudable endeavour, but also to much foolish sentimentality and useless propaganda. Along with his genial derision for these, Dickens shows his scorn for shams, whether social, or political, or religious, or personal, in his presentment of the cousins and hangers-on of the Dedlock family, the unsavoury hypocrisy of Chadband, and the shifty complacency of Turveydrop.

The pleasant, wholesome element of simple humanity is supplied by the "interiors" of Mrs. Rouncewell's domain at Chesney Wold, the household of Bagnet the bailiff, and the shooting-gallery of Mr. George. The opposite is represented in the detestable Smallweed family.

The great variety of incident—often in no way striking or important—and the large number of characters introduced, make the novels of this writer, and especially the one we are considering, rather a gallery of pictures or a collection of records than one plain, connected story. Indeed, even the great skill of the author, and his infectious interest, or enthusiasm, or indignation, cannot always overcome a certain feeling of fatigue in the reader. So many claims are made upon his attention, or his judgment, or his sympathy, as one episode succeeds another, garnished with fervid and energetic description, that only those with some readiness of perception and sympathetic imagination can follow with unflagging interest and satisfaction the course of the varying fortunes presented.

But to these the book will appeal with irresistible effect; and though the lapse of half a century and more will have made certain expressions and certain estimates to appear old-fashioned and even worn-out; and though the humorous side is rarely dainty and sometimes mere farce, the satire clumsy, and the tenderness overcharged to sentimentality, yet, after all drawbacks of time and manner, there is an immense residue of what is real and true and lasting.

In previous papers of this series it has been suggested that many of the great authors in our national literature wrote as they did because they were moved with the spirit of the times in which they lived. Hence, in such, the temporary and occasional, as shown in the evils they oppose or the causes they support, somewhat overshadow the things which are permanent and universal in human life and character. To a certain extent this is true of Dickens. His marvellous skill in depicting conditions and circumstances and personal peculiarities is not

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equalled by that with which he deals with the inner motives and springs of human action.

To the Londoner of Dickens's own day his descriptions of the great city as setting and background for the action of the story was a continual delight. Those who knew the places found them to possess new meaning and a fresh spirit from his presentation, and those who did not had them as clearly visualised and understood as though they were really acquainted with them.

The manner of telling the story is an unusual and difficult one. Part is told by the author, and then a chapter or chapters, in the form of a diary or record, by Esther Summerson, the heroine—if there be one. She is of an amiable disposition and gentle nature, and her estimate of others is unfailingly kind. But the reader cannot fail to notice that the transition from the manner of Dickens the novelist to that of simple Esther Summerson is not always quite happy. The quiet child and the unassuming girl observe and comment and deduce with something of the author's comprehensive knowledge and a good deal of his fluent exposition.

One of the less admirable personages in the story, Horace Skimpole, is supposed to be a rather cruel portrait of Leigh Hunt, the friend of Keats and Shelley; and Laurence Boythorn, with his perplexing combination of ferocity and gentleness, a kindly one of Walter Savage Landor.

Bleak House is full of effective situations and rememberable phrases. Many touches show the keen observation which makes the writing of Dickens so telling and true compared with the second-hand and conventional descriptions of lesser novelists. In the more pronouncedly ludicrous scenes and characterisation there is often a touch of caricature; but in the soberer ones the behaviour and the personality of the actors are made clear and convincing in a few details of gesture or speech.

Finally, in spite of the misery and the disappointment revealed, the tragedy and the violence, the general effect of the book is not one of sadness. Perhaps this is partly because none of the characters have become sufficiently known to us, or even familiar and understood, before the catastrophe which involves them takes place. Partly, too, no doubt because there are so many characters and so rapid a succession of incident that our interest has not leisure to become strongly centred upon any individual personality.

Very different are the tone and atmosphere of the simply-named *Tale of Two Cities*. By means of a plot which connects the trial of a spy in London with the terrible events of the French Revolution in Paris, these "two cities" are grimly linked together in the tale. It was written in 1859, six years after *Bleak House*, and appeared month by month in the journal *All the Year Round*, of which Dickens was editor. It was one of the earliest novels in the immense collection which we now possess dealing with the appalling scenes in Paris during the Revolution. Men's minds had been too greatly shocked, their hearts wrung, and their nerve shaken by that terrifying experience for any early attempt to be made to weave its circumstances into fiction.

The sombre progress of the story is relieved only slightly and rarely by the introduction of a lighter element, and that element is rather saturnine than amusing. The domestic tyranny of Jerry Cruncher the bank messenger, and the peculiarities of Miss Pross, supply brief diversion; but the onward march of the story is not interrupted by any sustained description of characters and episodes apart from the main ones.

The setting in London is again in the region of the law and lawyers, and in Paris in the working-class district of St. Antoine. The portrait of the still, self-contained woman, Madame Defarge, is one not to be forgotten. In it is perpetuated the relentless and persistent spirit of revenge which filled the women of the Revolution when once the bounds of patience and endurance were passed. The sinister suggestion of her apparently harmless knitting is quietly terrifying, and her appearances at successive points of the story prepare us for the culminating tragedy.

Most moving is the pathetic figure of the hapless prisoner of the Bastille, crushed, humiliated, reduced from manhood to a human machine. There we have, as it were in miniature, the representation of the broken hearts and ruined lives of the system of government, symbolised by the great frowning prison. The apparatus of bench and leather and tools—so connected with the white-haired Dr. Manette—is set off against the knitting of Madame Defarge. It is strange to realise how the click of the needles and the tap of the hammer seem to remain with us as an essential part of the story.

The hero of the story—for this time there is an indisputable hero—is introduced dramatically during the trial of the spy in the early scenes in London. His resemblance to the prisoner, and his slovenly and careless bearing, suggest the coming tragic development. Not that he is ever prominent in the story; we have a glimpse here and there, but usually with all noble capacity concealed or obscured by faultiness. This presentation of character was sufficiently unusual to make Sydney Carton not only a popular but almost a universal hero.

The description of the French nobility, in the second book, as instanced by Monseigneur, "In Town" and "In the Country," places vividly before the modern reader the evil conditions of so long standing which brought about the Revolution. When this is read early in life no later knowledge or more balanced statement suffices to destroy or to counteract the effect it has upon the mind. It colours all succeeding impressions. The man for whom the sacrifice is made, Charles Darnay, is the innocent inheritor of the harvest whose sowing was the work of his ancestors. He is depicted as honourable and generous; but it is not his personality or his wrongs which appeal to Sydney Carton. His voluntary and resolute substitution of his own life for Darnay's is the outcome of an entirely devoted and unselfish love for Lucie.

It is a terrible picture which is presented in the later chapters of the book. The reading of the paper written by Dr. Manette in his "doleful cell of the Bastille," nearly thirty years before, so nearly precedes the actual account of the prison life in the gloom and suspense of the prison of the Conciergerie that the mind is oppressed with the weight of misery endured and to come. In the early days of the condemnations the persons arrested were at least those upon whom, from their position or their antecedents, suspicion might justly fall. But as the days and weeks passed, the thirst for revenge and for blood became fiercer with the gratification rather than slaked, and any circumstance, even the most trivial, was enough to furnish a charge of treachery against the "Republic One and Indivisible. Liberty, Equality, Fraternity, or Death."

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4. In *A Tale of Two Cities* Dickens had Wilkie Collins for collaborateur. Try to determine his share and that of Dickens.

5. In what respects do these books help you to form a clearer idea of the life of the times dealt with in each?

N.U.T. NOTES.

BY ALLEN CROFT.

FOR many years subsequent to my *début* on the Executive, away back in 1895 (and, *par parenthèse*, it comes almost as a shock to me to think that to-day only Messrs. Hamilton, Ellery, and John have a longer uninterrupted record at Russell Square than myself), school attendance, and the lax administration of attendance bylaws, provided abundant material for the criticisms of our speakers at both public and local association meetings. Happily, however, a much healthier opinion regarding school attendance seems to have been generated amongst parents and administrators, and it is rare indeed that a member of the Executive is asked to make the topic a subject of his philippics. Statistics, one often hears, can be made to prove almost anything, and the dictum is probably partly true. Yet one cannot ignore the fact that, according to the belated figures of the Board of Education, the percentage of actual average attendance to average number of scholars on the registers reached 89·62 for the educational year 1906–7.

School Attendance—

Of course attendance at school varies very considerably in different localities, and therefore it is not surprising that amongst the motions for conference which attained a prominent place on the agenda (but which was never reached at Morecambe) was one strongly protesting "against the lax administration of the attendance bylaws of many education authorities." When this matter came before the Executive, holding the opinion that matters were not nearly so unfavourable as the resolution implied, I moved that an inquiry be instituted amongst the local associations, and the result certainly seemed to justify the trouble taken by the secretaries. Altogether, 283 replies were received at Bolton House, and in 211 cases the associations reported that the attendance bylaws were administered satisfactorily in their area. In the remaining 72 cases complaints of various kinds were made, though in many instances it was stated that the Local Education Authorities do everything possible to enforce the bylaws strictly, the principal occasion for censure being the excessive leniency of the magistrates.

* * *

I SUPPOSE I should do the "great unpaid" little or no injustice were I to suggest that a fairly large proportion of them, especially in country districts, have still to be convinced of the desirability, much less of the necessity, of giving all children a fair chance in life's handicap. Therefore it is not particularly difficult to understand the readiness of magistrates to accept parents' excuses, and the ridiculous nature of the penalties imposed for breach of the bylaws. Fines of 6d., 1s., 2s. 6d. are frequently inflicted, often without costs, which thus fall on the ratepayers of the locality; and parents find it easy to pay a fine which can frequently be earned by the child in a single day, and to continue to keep him away from school. Sometimes the fines are allowed to remain unpaid, and it is further stated that smarter penalties are generally imposed by a stipendiary than by the ordinary J.P.

—And its Weak Spots.

Many defects in administration were quoted by the Association secretaries, some of which are (*a*) delay in dealing with bad cases of irregularity, which must be reported to committee before action taken; (*b*) illness accepted as excuse without medical certificate; (*c*) no action taken when children absent themselves at certain periods for the purpose of agricultural employment; (*d*) "odd days' absences" never dealt with—cases must be habitual; (*e*) too many "cautions" and "warning notices" served—cases continually postponed for improvement; (*f*) timidity in ordering prosecutions; (*g*) multiplicity of duties of attendance officers, whose area is frequently too large to be worked effectively.

There are also complaints from various localities on account of children leaving school at a particularly early age; and I trust the day is not far distant when no child will be exempted from school attendance until the age of fourteen years is attained.

Les Meilleures Pages des Ecrivains Pédagogiques de Rabelais au XX^e^ Siècle. Extraits avec un Avant-propos et des Notes par Edmond Parisot, D.-ès-L., et Félix Henry, Directeur d'Ecole Normale. Préface de Jules Payot, Recteur de l'Académie d'Aix. (Librairie Armand Colin, Paris.)

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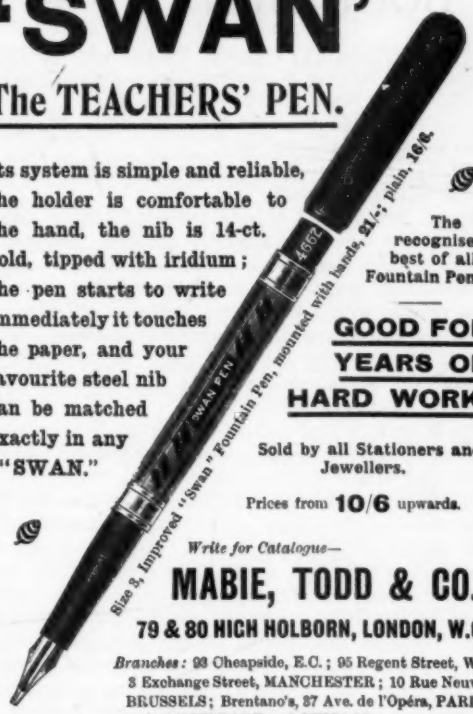

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NEW MATHEMATICAL BOOKS.

1. **Elementary Algebra.** By C. H. French, M.A., and G. Osborn, M.A. (Cambridge University Press. 500 pp.) 2. **School Algebra (Part I.).** By W. E. Paterson, M.A., B.Sc. (Oxford: Clarendon Press. 328 pp. 3s.) There is a considerable similarity in the aims of the authors of these two books. In both an attempt is made to present the fundamental parts of the subject more fully and in simpler language than is usual in text-books, and in both a list of technical terms is given—in one at the beginning, with definitions of the terms; in the other at the end, in the form of an index. These lists, the authors claim, enable them to adopt "simplicity of style" and to use "simple, even colloquial, language." This common property of the two books—namely, a full treatment of the elements of the subject—will probably decide most schoolmasters for or against them.

Both are sound and useful text-books with quite a wealth of examples. The advisability of bookwork for beginners is, however, a debatable point. Some schoolmasters find it convenient to let their pupils have books with a full treatment of the subject, which they can read, and to which, after oral teaching, they can refer. On the other hand, many schoolmasters think this unwise. They doubt the ability of young pupils to read such discussions for themselves, and find that the possession of a full text tends to make pupils inattentive to oral instruction. They find that the young pupil tends to rely too much on the book, to refer back to printed rules and sample examples, rather than striving to work out the exercises themselves. Such schoolmasters—and we agree with them—require only an intelligently arranged collection of examples, and delight to evolve the subject themselves orally. To these masters these books will hardly commend themselves.

The extent of the explanations and directions given in the text may be gauged by the following extracts:—

1. "These dashes are not indices; $a \times a'$ only makes aa', and in adding a to a' we only get $a + a'$. The coefficient a' is generally pronounced a-dash; b' is called b-dash; and so on. The coefficients a_1, a_2 are pronounced a-one, a-two, etc."

"To multiply $\frac{x}{4}$ by 12, we say 4 goes into 12 three times, and three times $x = 3x$."

"In trying to work out problems for yourself, attend to the following directions:—

"(1.) Read the question carefully through so as to understand what it means.

"(2.) Begin by writing: Let x represent what you want to find, or one of the numbers you want to find if there are several, etc."

2. "The process of finding the sum of a number of equal quantities is called multiplication, and is usually denoted in arithmetic by the symbol $\times$, and sometimes by a full stop—for example, 7×8, $7 . 8$.

"These both mean 7 multiplied by 8, or 7 times 8.

"The full stop must not be confounded with a decimal point, which is placed higher up."

"In solving an equation the following points should be carefully observed:—

"(1.) Begin by copying the equation in its original form.

"(2.) Never begin a line with the sign =.

"(3.) As far as possible keep the signs of equality in the same vertical line, etc."

"Many marks are lost in examinations through copying the question wrongly."

Messrs. French and Osborn make no further claim in their preface beyond simplicity of style, with an explanation that their book is not intended to replace, but to assist, oral teaching. Their syllabus covers the usual ground to the end of the binomial theorem, with a positive index, and also includes logarithms. Graphical work is clearly explained, and the authors have avoided the undesirable extreme and given a reasonable amount of this work.

The book is a practical work written by experienced teachers, and may be safely recommended to masters who prefer to use books of this type.

Mr. Paterson, on the other hand, states the principles on which he claims his work has been carried out. "By means of examples, some worked in the text, others set as exercises, the student is led to discover or verify the fundamental laws of algebra. This experimental method is continued throughout the book." "The problem is regarded as the important type of example, and most of the various algebraic operations and processes are introduced as being necessary for the solution of some practical problem." It is true that some examples occur before the type has been discussed, but we doubt whether they are sufficient in number or of the character to lead the student to discover the laws of algebra. On the other hand, the author has a tendency to give rules more readily than in most text-books, and probably more frequently than is wise. For example, rule for multiplication: "When two quantities are to be multiplied together, multiply the two numbers as in ordinary arithmetic, taking no notice of the signs, and then prefix + if the quantities are alike, − if the quantities are unlike."

One of the greatest difficulties the teacher has to contend with is the universal determination born in the human animal to deduce the general case from a single instance. The teacher may explain the fallacy with endless examples, nevertheless boys quite advanced in the work, even candidates for university scholarships, will again and again fall into this temptation. It has been largely fostered by measurement work in geometry, and also by graphical work. It is most important, then, that the pupil should by every possible means be guarded against general deduction from a special case. In Mr. Paterson's book we cannot but feel that this bad habit is fostered. Considerable deductions are made from diagrams dealing only with whole numbers; the cart is before the horse. If a pupil is to be led up to an idea, it must be by means of a *large number* of special cases. Mr. Paterson has his doubts. On page 20 a footnote reads: "The student must be warned that a rule cannot be proved by considering a special case; we are, however, led to see what the rules are by considering several special cases. In later chapters proofs of these rules will be given." But one footnote will not make amends for what we feel is some encouragement of a tendency which years of patient effort fail to eradicate from a boy's mind.

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Another general feature of the book is the graphical work. In our opinion there is an excess of this work. The author states that in the case of simultaneous equations where an answer to two significant figures is required, the graphical method is especially useful. We doubt whether the method has any claims to utility, and fancy any fair mathematician could find answers to the necessary degree of accuracy more rapidly than he could draw the graph of one of the equations.

The serious difficulty of units is not sufficiently recognised, especially in the case of equations of higher degrees than the first. We are convinced that the function of graphical work is to illustrate, and that its chief usefulness is in works on the theory of equations and analytical geometry.

In one or two minor details we differ from the author. For example, in his definition of homogeneous equations he calls $x^2 - 3xy - y^2 = 9$ and $2x^2 + 2xy + 3y^2 = 7$ homogeneous. This will lead to difficulty when the pupil is studying analytics.

We hope the following example on page 143 will be deleted from any subsequent edition :—

"Solve $3x(x-2) - 2(x-2) = 3(x-1)(x-2)$.

"Wrong method. Divide by $x - 2$. $3x - 2 = 3(x-1)$.

"Remove bracket, $3x - 2 = 3x - 3$.

"Transpose, $0 = -1$."

And we have not found the value of x, and have got an impossible (!) result. We should add that there is a goodly variety of examples taken mainly from examination papers, and we venture to suggest that an edition containing the examples only would be more acceptable to most teachers.

Examples in Elementary Mechanics. By W. J. Dobbs, M.A. (Methuen and Co. 344 pp. 5s.) The book is intended for the use of schools and technical institutes, for army and navy candidates, students of engineering, and for the junior classes in the universities.

For engineering students as a first course and for army and navy pupils it should prove a useful book. The text consists mainly of examples. Of these, 159 are practical exercises of the usual laboratory type of which Mr. Worthington was, we believe, the pioneer. These practical exercises occur rather irregularly, and their function is to lead up to the theoretical questions. Where this is impossible they are replaced by short explanatory passages and worked-out exercises. Many of the practical exercises are interesting, but from the schoolmaster's point of view they would occupy too much time. Were mechanics one of six subjects in the older schoolboys' curriculum it might be done, but the time allowance in mechanics is usually small.

It is a pity that the author did not content himself with an outline of his intentions. His preface, however, challenges discussion; he is apparently in sympathy with the militant engineering section. He writes: "One of the results of the altered methods of teaching will be the gradual breaking down of the *artificial barrier* which has been allowed to *grow up* between theoretical mechanics and applied mechanics." The analogy is unfortunate, and we deny the existence of any barrier.

Theoretical mechanics as a subject has been built up logically on certain fundamental laws which have been accepted as the basis of the argument. These laws are the approximate expression of experimental results or observations. As Professor Love says: "Its validity is unaffected by the question whether it has or has not any relation to the observed motion of natural bodies." The subject is a worthy one in itself; it is still more so in that much of the knowledge gained can be applied in some of the practical spheres of life.

The relation between theoretical mechanics and its application is identical with the relation between theoretical geometry and its application. The only question at issue is at what stage it is advisable for the student to study its application. The utilitarians believe that a subject has no value except for its practical application; they omit the fact that the subject may be an excellent mental training for the general pupil, though only the few will actually apply this particular knowledge to the task of making a living. So cricket is an excellent physical training; only the few will live by it.

But analogy is dangerous. We would commend the next extract from the preface to the student of logic as a subtle example of false analogy: "I have no hesitation in commencing with the subject of statics, though some teachers prefer to start with kinetics. To my mind that seems like asking a child to run before he can stand or walk." We suggest that teaching statics is like asking a boy to accomplish the one task impossible to him—that of either standing or of sitting still.

But this is comparatively trifling. We cannot think that the author intends to make any serious bid for the adoption of his book by the schoolmaster; if so, he would hardly have quoted here one of those ill-digested diatribes which the Armstrong-Perry (the order of the names is merely alphabetical) clique at times hurl at the head of the hardworking schoolmaster. He quotes: "Professor Armstrong says, 'Professor Perry's scheme lacks the detail which is necessary to make it go. It is all so simple to Professor Perry; he thinks a mere indication of his method will be understood. But the average teacher needs spoon-feeding at present; it is no good to advise him what to say; the professor must himself buy and prepare the food and present it to the very patient's mouth.'"

This does not hurt the schoolmaster, for in one thing we all agree with these two professors: we are each of us above the average. Nor need the more modest of us take serious umbrage; the worker is always the subject of such attacks, however little he may be responsible for the work he is called upon to do. Let him read the magazine correspondence, the articles, the lectures of this clique, and he will readily see how narrow-minded a view of education they take, how small an island in the educational ocean is this paradise of engineers. We have no doubt it is all so simple to Professor Perry; the difficulty is that teaching and how to teach is "all so simple" to so many men who have never had to teach day by day the boys and girls in our schools.

No teacher objects to advice, no teacher will refuse to weigh that advice and act accordingly, and he should not be subject to such wild attacks from men who, under more favourable conditions, are engaged in similar work.

Let us all recognise that there are many educational forces, and the important thing is that their resultant should tend to produce clean-minded, clear-headed boys and girls. The obviously utilitarian is not necessarily the best; to get into the house it is better to go round by the door than to force a straight passage through the walls.

NOTE.

Last month we inadvertently gave the wrong title to Mr. F. Castle's new book, just published by Messrs. Macmillan. It ought to have been *Practical Arithmetic and Mensuration.*

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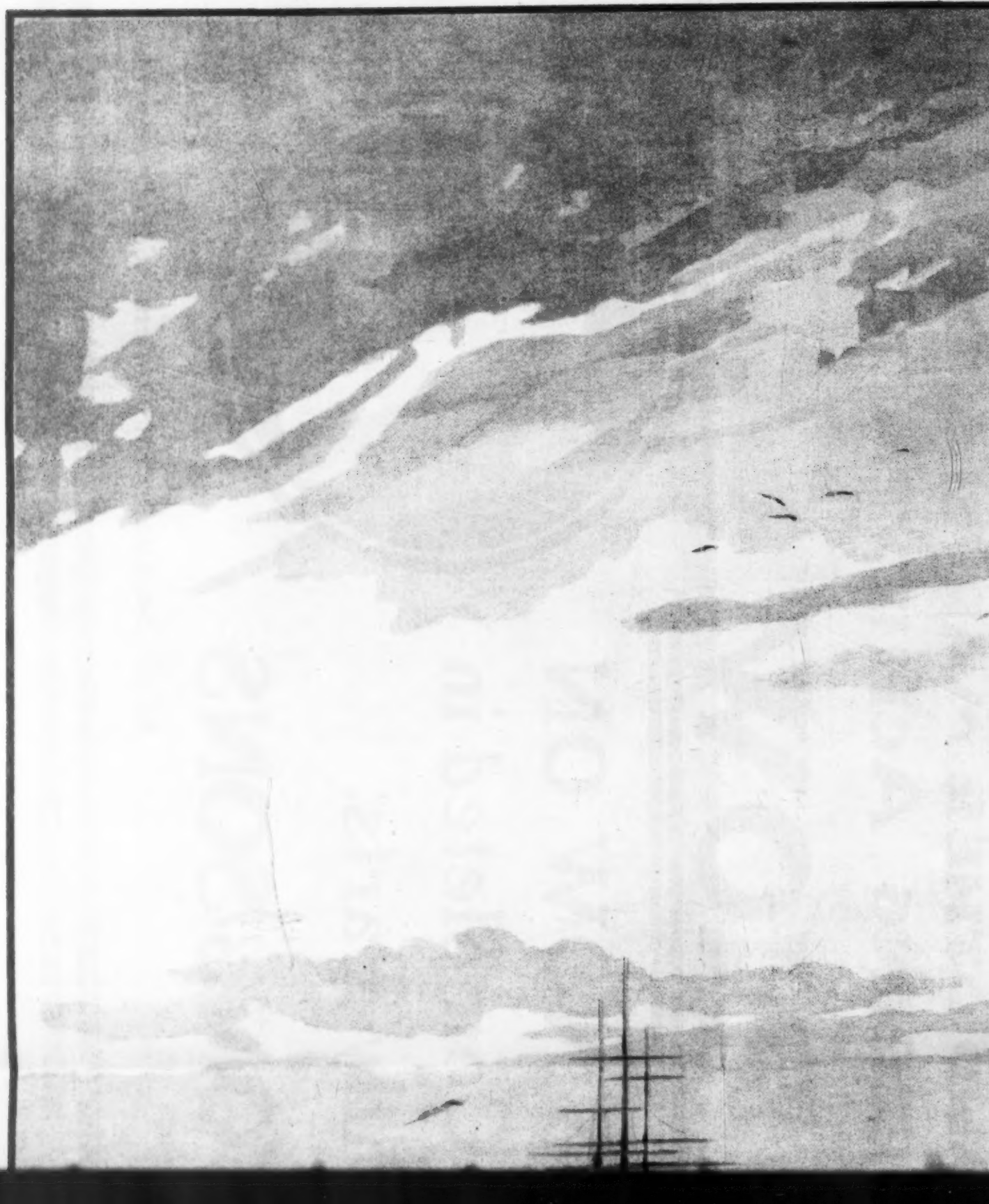

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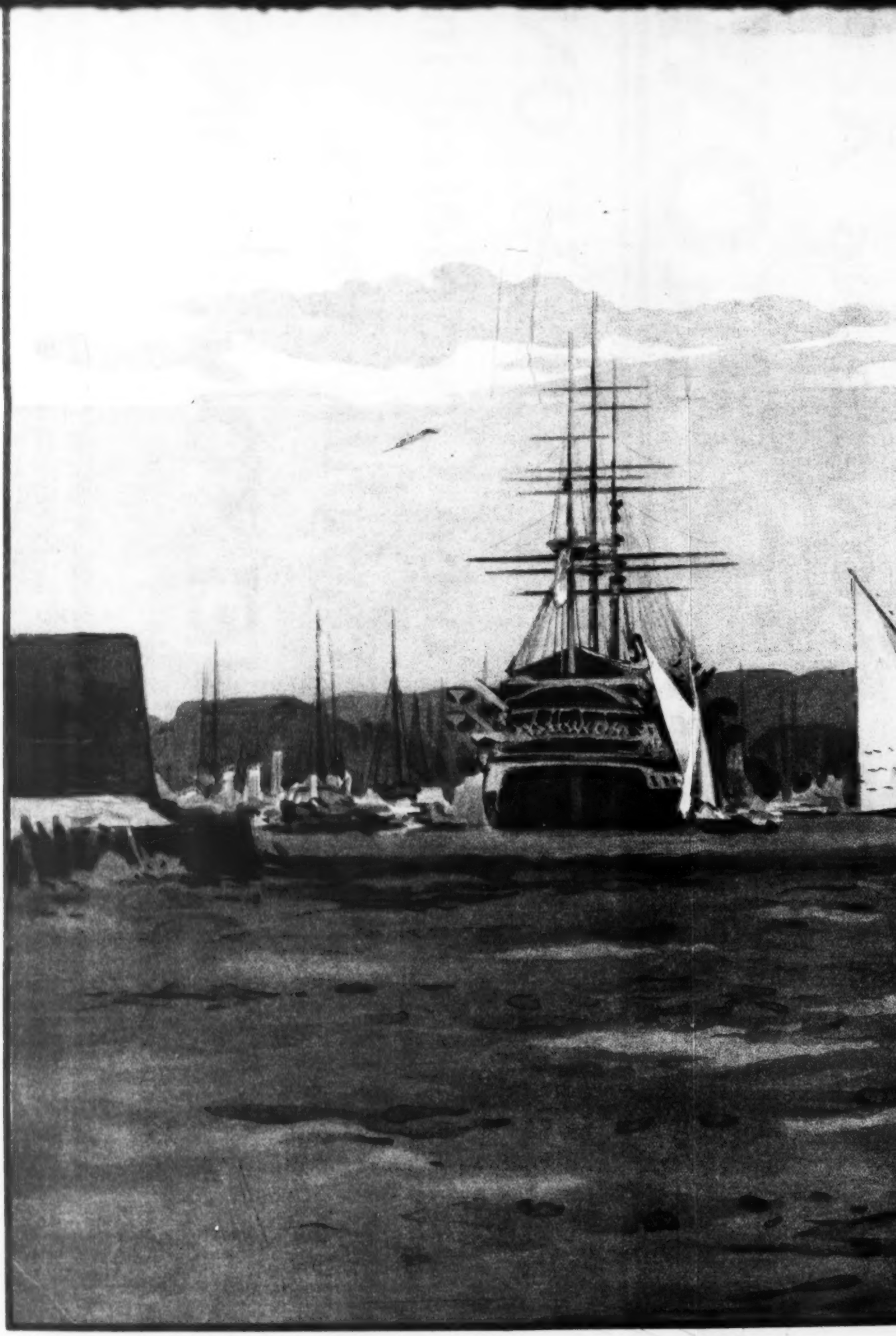

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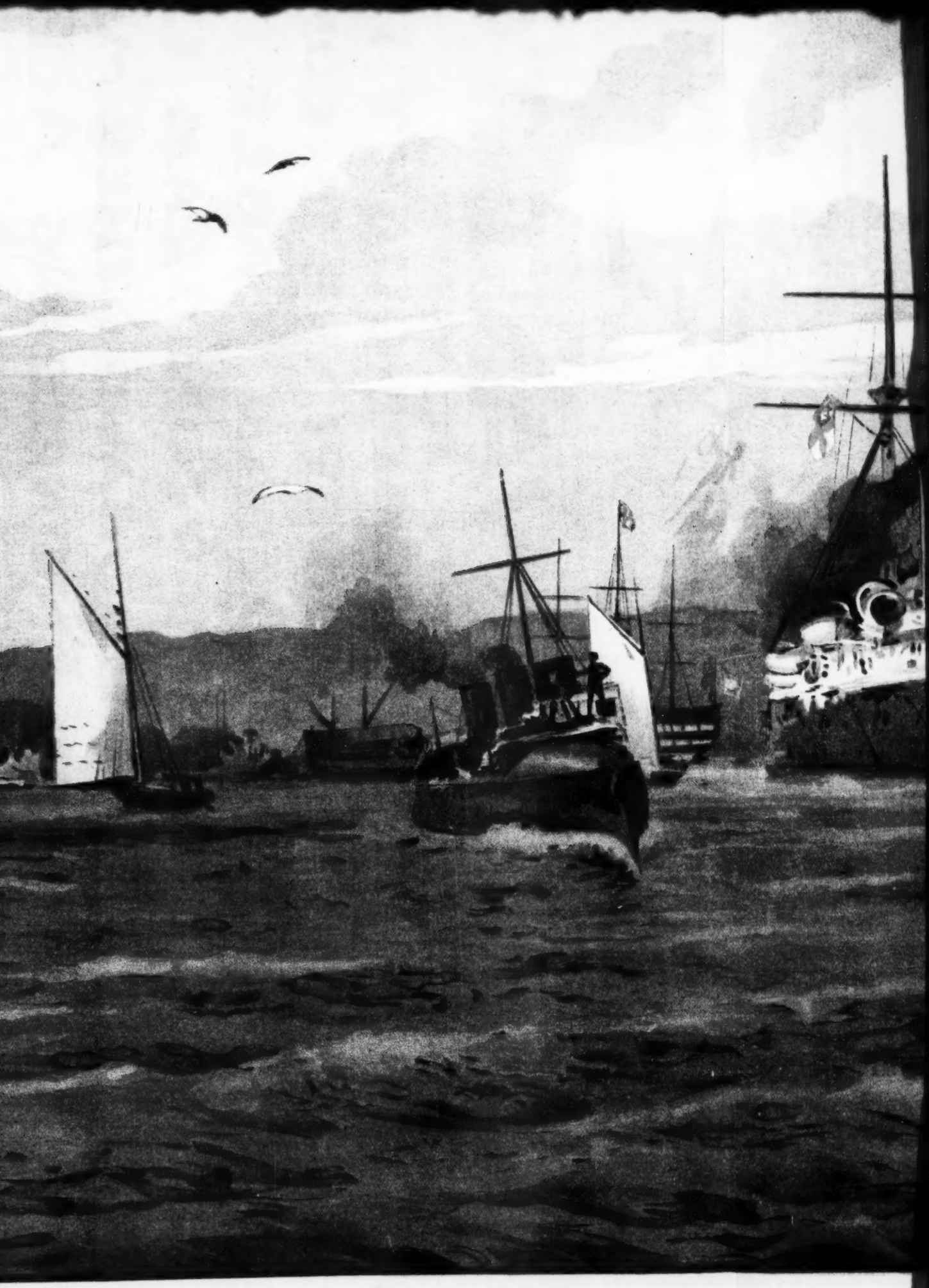

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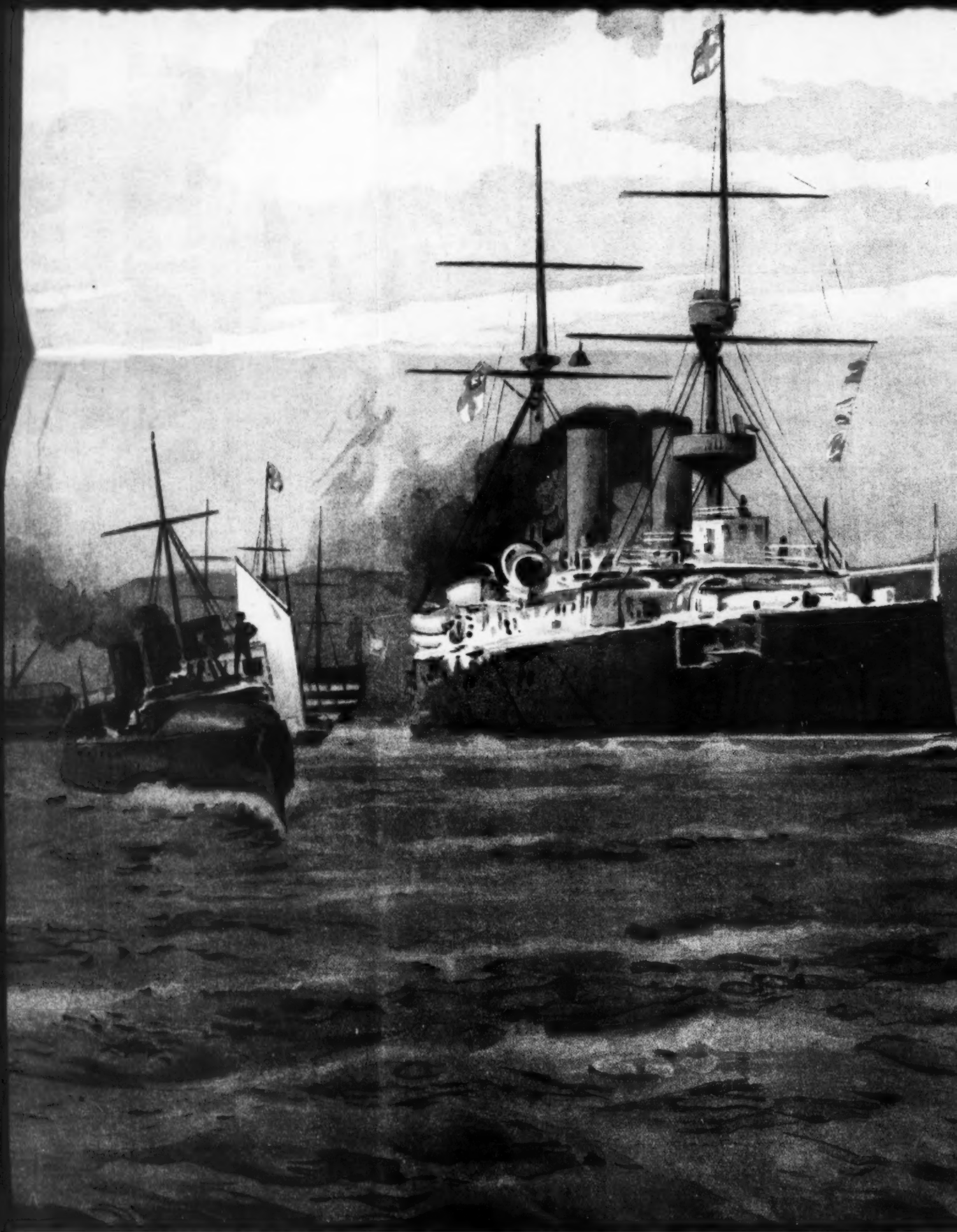

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PRACTICAL TEACHER
June 1909

Printed and Published by Thomas Nelson & Sons, Proprietors, at the Office of "The Practical Teacher," 35 & 36 Paternoster Row, London, E.C.